Saturday 23 July 2016

Amateur Photographer

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World's sharpest lenses Over 80 top performers for every system and budget

Sharp shooter Guy Edwardes' tips for achieving crisp shots like this

Image stabilisation How it works and which type is best for you

THE Sharpness ISSUE

Get your **sharpest shots ever** with our **expert guide**

- **36 tried and tested** ways to sharper shots
- **16 top tripods** and other supports from £30
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PLUS How **Levon Biss** creates the most detailed insect images you've ever seen

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COVER PICTURE © GUY EDWARDES

7days

A week in photography

Today's photographers are obsessed with sharpness in a way that we never used to be. Browse a collection of classic photos and you'll discover that few are as critically sharp as we'd expect nowadays; indeed, Henri Cartier-Bresson once said 'sharpness is a bourgeois concept'. Does that make them less great? No. But years of digital innovation, in which sensor resolution went from being inferior to film to leapfrogging it, have raised our expectations – along with parallel improvements in optics and processing software. High-resolution sensors, combined with modern lenses, enable us to produce more detailed images than ever before, outside of the larger film formats. But achieving them requires more knowledge than it used to.

This week's issue is dedicated to sharpness and how to maximise it: camera tips, software secrets, the crispest lenses and much more.

Nigel Atherton, Editor

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ONLINE PICTURE OF THE WEEK

I'm Landing Here by Christopher Howes

Nikon D7100, 300mm, 1/2,500sec at f/7.1, ISO 250

This image of airborne gannets, by AP reader Christopher Howes, was uploaded to our website gallery. Gannets are a popular subject to photograph, but it's not always easy to capture them from a fresh angle.

'This picture was taken on the Saltee Islands, just off the coast of Co Wexford in Ireland,' says Christopher. 'The gannet was coming towards me so fast, I had to lie down very quickly to try to get it in frame just before it landed.'

The success of this image lies in the fact that the birds are airborne and there is a sense of narrative. In the background we see two birds in flight and, in the foreground, we find one getting ready to land. The foreground gannet is in pin-sharp focus as well, which is not an easy task to pull off.

IMAGES MAY BE USED FOR PROMOTION PURPOSES ONLINE AND ON SOCIAL MEDIA

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Via our online communities Post your pictures into our Flickr group, Facebook page, Twitter feed, or the gallery on our website. See details above.

Transparencies/prints Well-packaged prints or slides (without glass mounts) should be sent by Special Delivery, with a return SAE, to the address on page 18.

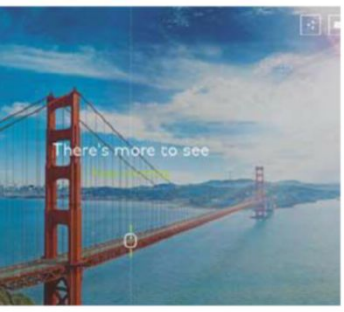
NEWS ROUND-UP

The week in brief, edited by Chris Cheesman

Laowa confirms 12mm full-frame lens

Chinese lens brand Laowa has confirmed the upcoming UK launch of a 12mm f/2.8 full-frame lens. The new manual-focus lens is expected to be compatible with DSLRs and mirrorless models from Nikon, Canon and Pentax, as well as Sony E-mount cameras. The 12mm f/2.8 ultra-wideangle lens is expected to go on sale in August, at a price yet to be announced. The 570g lens is built from 16 elements in 10 groups and contains seven aperture blades.

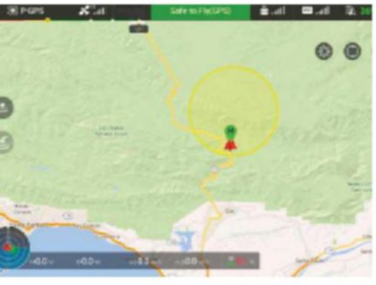
The '53-billion-pixel' photo



A '53-billion-pixel' photo of a Bentley on the Golden Gate Bridge in the USA allows the viewer to zoom in to see the stitching of a seat inside the car 700m away. Commissioned by Bentley Motors, the image comprises 700 shots from the same location stitched together digitally. Visit www.bentleymotors.com/en/apps/look-closer.html.

Sigma solves converter glitch

Sigma has released new firmware to correct an 'overexposure' problem when its Nikon-mount 150-600mm f/5-6.3 DG OS HSM lenses are attached to the Sigma TC-1401 teleconverter on a Nikon D500. The free firmware is available at www.sigma-global.com/download.



Drone no-fly zone

Drone maker DJI has extended its 'no-fly zone' technology, using an app to prevent devices being flown over sensitive locations. It bolsters geofencing technology introduced three years ago. Visit www.dji.com/flysafe/geo-system.

Nikon compact delays

Nikon has further delayed its Coolpix A900 and B700 compact cameras, blaming the earthquakes that struck Kumamoto, Japan, in April. First announced in February, Nikon had put the launches on hold until July to allow more time for 'software adjustment'. They are now expected out in October.

© MATT CARDY/STRINGER/GETTY IMAGES

WEEKEND PROJECT

Get reflective

Even in high summer, bad weather is a fact of life in the UK. The key is to try to make the best of all conditions. Every form of weather offers photographic opportunities, particularly when it comes to rain. With that in mind, photographers should think about making the most of reflections. Puddles are one thing, but you can also take images of reflections in bodies of water such as lakes or rivers, or objects in glass. With larger bodies of water, early morning is a good time for reflections as the light can be at its best (mist or fog shouldn't reduce clarity). If you are shooting water in sunshine, use a polarising filter to reduce glare. In fact, many professionals just keep them on their lenses. Meter carefully and try to preserve some semblance of the shape that is being reflected to stop it appearing as an amorphous mass.

1 Reflections in puddles add a creative twist to tourist hotspots. Night scenes can work well in puddles, such as bright neon lights or the shapes of passers-by. Switch to manual focus to stop your camera's AF getting confused.

2 Try to include interesting elements (such as the bird here) or remove distracting ones. Use a tripod for reflections in 'big' water. Choose a narrow aperture to maximise depth and field and ensure front-to-back sharpness.

BIG picture

Beautiful and rare lunar scenes above Somerset's Glastonbury Tor

As familiar as the moon is, it's a cosmic mass still capable of delivering a few surprises. In this stunning picture from Matt Cardy, we see this 4-billion-year-old satellite of the Earth appearing to rise behind Glastonbury Tor in Somerset as people gathered to celebrate the summer solstice in June.

June's strawberry moon, a name given to the full moon by Native Americans because it marks the beginning of the strawberry-picking season, last occurred on the solstice of 22 June 1967 and will not happen again on the summer solstice until 21 June 2062 – in 46 years' time. The magnified moon is an optical illusion (the reasons have still to be fully agreed upon) in that it appears larger near the horizon than it does higher in the sky.

Words & numbers

There is nothing worse than a sharp image of a fuzzy concept

Ansel Adams (1902-1984)
American photographer and environmentalist

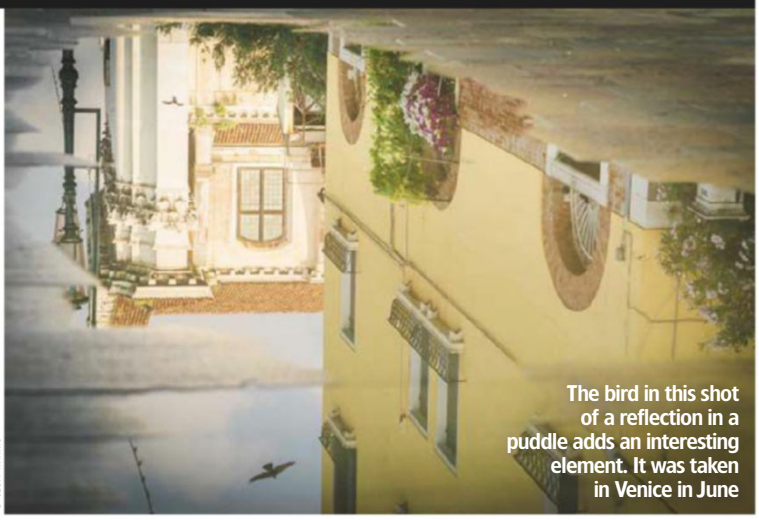
$34 thousand

Amount raised on Kickstarter for Bird Photo Booth 2.0 – a revamped 'world's first wireless feeder and birdcam'

SOURCE: KICKSTARTER

3 With reflections in glass, be wary of smears or glare reducing detail. Consider using a polariser or even wipe the glass with your sleeve. Don't use straight-on flash as you will get a reflection of it firing.

4 Black & white conversions can work well, as can enhancing colour of neon lights in puddles. Try not to lose shadow detail, or rescue underexposure to increase noise. A square crop or panorama can also look good.



The bird in this shot of a reflection in a puddle adds an interesting element. It was taken in Venice in June

© GEOFF HARRIS

Consumers are set to pay around 10% more for Chinese-made Laowa lenses

Camera prices to rise in wake of Brexit vote

CAMERA prices could rise by up to 15%, as the UK's vote to leave the EU pushes up import costs.

The value of the British pound has plunged more than 15% against the Japanese yen since the 23 June EU referendum – a greater slide than against the Euro or US dollar, with the latter falling by around 11%. This means it has become more expensive to import products from overseas, especially from Japan where many cameras are made.

Futuresource Consulting market analyst Arun Gill said he expects a 5-10% rise in UK camera prices. However, Roscoe Atkins, managing director of Park Cameras, which runs stores in London and West Sussex, warned that prices could rise from 8-15%, from August.

'These levels of [exchange rate] change are too high compared to the profit margins manufacturers or retailers make ... this does mean that price increases ultimately will have to be passed on to consumers,' Atkins said. He explained that most camera components are manufactured in Japan and countries with cheaper labour costs such as Thailand, Indonesia, China and Taiwan. Atkins said customers who use higher-end cameras will suffer most because these models have most parts made, assembled and tested in Japan.

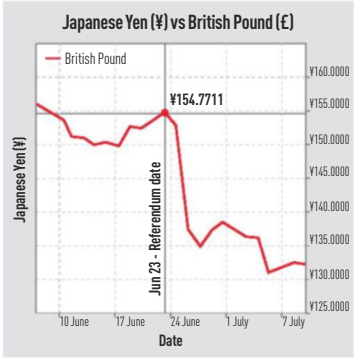
London Camera Exchange, which runs 29 stores nationwide, said a few manufacturers have suggested price rises 'perhaps as early as August'.

Online photo retailer Speed Graphic was first to officially raise prices. The price of its Novoflex accessories rose at least 10%, starting from Monday, 11 July. 'Even though much of what is sold is produced in China, it's often purchased in dollars, so our advice is not to delay with any planned major purchase,' it said.

Intro 2020, which imports brands such as Tamron, Cokin and Hoya, plans to raise prices by up to 12% on most products from 1 August. UK Optics plans to raise the price of Chinese-made Laowa lenses by around 10%, but will 'subsidise' the higher cost of accessories where profit margins are higher, and freeze prices on new products. Kenro, which imports popular brands such as Nissin flashguns, said increases were likely in the 'near future'.

However, Futuresource suggested that the effect of exchange-rate changes may not be passed on to customers in full for the more expensive cameras. And it expects retailer channels to absorb some of the exchange-rate fluctuations 'to keep volumes moving,' in what are 'already challenging times for the imaging industry'.

Olympus, Leica, Sigma and Ricoh Imaging said they were reviewing the situation. Fujifilm UK said it had yet to decide on price increases, and Hasselblad did not rule out a rise. Nikon, Canon, Sony, Zeiss, Panasonic and Jessops declined to comment on the price impact For the full story, visit amateurphotographer.co.uk.



DATA SOURCE: YAHOO! FINANCE

Sony reveals new 50mm f/1.4 lens

SONY has revealed a premium standard prime for its Alpha 7 series cameras. The Sony Zeiss Planar T* FE 50mm f/1.4 ZA is due out in July at an estimated price of £1,500.

The lens employs 12 elements in nine groups, including one advanced aspheric element promising sharper images from centre to corner, one conventional aspheric element and one ED glass element for superior contrast and reduced chromatic aberration. Autofocus is driven by a ring-drive SSM.

Weighing in at 778g and measuring 83.5mm in diameter and 108mm in length, this is a distinctly large and heavy lens for its type. An 11-blade circular aperture aims to give attractively defocused backgrounds, and the lens has an aperture ring with a switch to set clicked or clickless operation.

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Sony's wireless flash system is aimed primarily at users of the Alpha 7 system

September debut for Sony's wireless flash system

SONY has given full details of the wireless flash system it has developed primarily for Alpha 7 users. Sony's new radio wireless flash system is based on FA-WCR1M commander and FA-WRR1 receiver units, designed to work with the firm's existing flashes.

Radio frequency control promises a 30-metre range, and up to 15 flash units can be used in five groups. In addition, the system enables synchronised remote-release shooting with multiple cameras, and a PC sync terminal means it can trigger studio flash heads.

Sony claims the system allows easy pairing between controller and receiver units, simply by powering them up within 1m of each other. A red/green LED light system gives quick visual confirmation of successful pairing. Sony says all settings on all the flash units can be set from the commander module. Both units are also dust and water-resistant.

The remote commander and receiver units will be available from September for £350 and £200, respectively.

Sony has postponed the release of its 70-200mm f/2.8 GM OSS lens until July. Originally due out in May and billed as a 'flagship telephoto', this lens will cost £2,500, while the 1.4x and 2x teleconverters will cost £550 each. Part of Sony's G Master range, the 'dust and water-resistant' kit is designed to give excellent optical quality on high-resolution sensors. Sony has not given a reason for the delay.

The 70-200mm f/2.8 is due out this month

Photographers compete in TV show

TWO amateur photographers are among contestants from across Europe competing for a €150,000 top prize in a TV talent show called *Master of Photography*. This programme, which is the first European TV talent show for photographers, will be broadcast on Sky Arts in the UK, Italy and Germany, and boasts the 'biggest prize ever offered in a European photography competition'. The first episode, due to be screened on 21 July, adopts 'the beauty of Rome' theme.

The *Master of Photography* series is due to be broadcast on Sky Arts from 21 July

For the latest news visit www.amateurphotographer.co.uk

Get up & go

The most interesting things to see, to do and to shoot this week. By Geoff Harris

STAFFORDSHIRE

© MATT HART

Fujiholics Family Photowalk

The first Fujiholics Family day will be held at Trentham Monkey Forest, Stoke-on-Trent, Staffordshire. 'It's in a great, safe place and there is plenty to do and shoot, both in Monkey Forest and on the Trentham Estate,' said the spokesperson and top street shooter, Matt Hart.

24 July, bit.ly/fujifamilywalk

VALE OF GLAMORGAN

© WALTER WAYGOOD

Where Will I Be

The Turner House Gallery features images by two Welsh photographers, Walter Waygood and Huw Alden Davies. Their work revolves around their family and friends, and a cast of local characters.

Until 3 Sept, www.ffotogallery.org/where-will-i-be

LONDON

© NATIONAL PORTRAIT GALLERY

William Egglestone: Portraits

This impressive show at the National Portrait Gallery includes 100 images that span Egglestone's career. Highlights include prints of his iconic images, last seen 40 years ago.

21 July-23 October, www.npg.org.uk/whatson

EDINBURGH

© JO SPENCE

Jo Spence

This exhibition at the Stills Gallery showcases two different aspects of Spence's work: documentary images from the 1970s, illustrating the educational workshops she developed, and examples of self-portraiture that reveal her pioneering use of photo therapy.

29 July-16 October, http://stills.org/

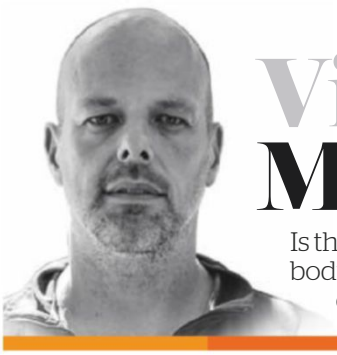
Environmental Photographer of the Year

Sixty images from the Atkins Chartered Institute of Water and Environmental Management 'Environmental Photographer of the Year' are on show at the Royal Geographical Society. Film-makers and photographers from 70 countries will be represented.

LONDON

© SARA LINDSTRÖM

Until 19 August, www.ciwem.org/epoty/



Viewpoint Mike Smith

Is there an overlap between legendary bodies of work and the banality of contemporary photography?

I bought *The Americans* (Robert Frank, 1958) because I'd seen one or two shots in a number of anthologies of photography and wanted to view the whole thing for myself. By looking at the giants of photography, you can begin to see a direction of travel for what was once considered contemporary.

Of course, any anthology is a curated presentation that restricts the reader to a limited range of work. Nonetheless, there had been a growing restlessness in purely artistic and abstract works, with the likes of Lewis Hine, Paul Strand, Eugène Atget, Brassaï, André Kertész, Dorothea Lange, Walker Evans and Henri Cartier-Bresson capturing images that focused principally on the person and his/her context.

Of course, not every photographer pursued art for the sake of it. Hine was an activist documenting American immigrants, while Lange worked for the Resettlement Administration on rural poverty, something Evans returned to in *Let Us Now Praise Famous Men* (1941).

This theme of reality and shock in reportage continued – for example, Nick Hedges' stark exhibition Make Life Worth Living, about 1960s urban poverty in the UK, or Daniel Berehulak's coverage of the Ebola outbreak in West Africa.

Contemporary photography moved on. Bresson often removed meaning from his (artistic) photos, generating thought around a transitory moment. The Americans drew the artistic and documentary threads together to create a photo essay on American culture; meaningless in the moment but building an understanding of society.

After Frank I often think of Garry Winogrand. At his death he left 2,500 undeveloped rolls of film. He was known for non-stop shooting, capturing moments on the street. Unlike Frank, there is a tension that moves the genre beyond meaninglessness towards banality.

Like Winogrand, Mark Cohen shot wideangle, close-up, choosing to avoid composition. These lack both meaning and visual poeticism. However, they are most certainly contemporary and pushed the boundaries of what had gone before.

Both Roger Hicks (AP 9 April) and Jon Bentley (AP 21 May) touched upon these opposing themes. Roger presented the banal – Pavel Baňka developing Cohen's work through intentional blurring – commenting that, 'Thirty years ago, or even ten, I might have paid little attention to this picture.' Jon focused on Strand's portraits from South Uist, noting that all the pictures speak on their own, without commentary. What I find interesting is the connoisseurship Roger notes is different, but is there an overlap?

Recently, I have found Malcolm Craig Gilbert's Flashbacks provocative (www.malcolmcraiggilbert.co.uk). It is intentionally banal – they are snapshots but need to be read within the author's context. With the image, 'A Report of a Man Approaching Children in an Alleyway' (below left), Malcolm notes (*After the Agreement*, Tuck, 2015) a 'flashback of my service in Newry when they were trying to shoot down helicopters. And then with it being a toy... there's this temptation to go forward and pick it up, that sense of going forward on trust that could leave you open to being murdered.'

It is intentionally ordinary but triggers a memory in the photographer – the text allows the viewer to access that memory and generate their own reactions to it. Ultimately, can photographs affect us at an emotional level, both consciously and subconsciously?

© MALCOLM CRAIG GILBERT

Gilbert's 'A Report of a Man Approaching Children in an Alleyway' accesses memory

THE VIEWS EXPRESSED IN THIS ARTICLE ARE NOT THOSE OF THE PHOTOGRAPHER

Mike Smith is a London-based wedding and portrait photographer. Visit **www.focali.co.uk**

Do you have something you'd like to get off your chest? Send us your thoughts in around 500 words to the address on page 18 and win a year's digital subscription to AP, worth £79.99

New Books

The latest and best books from the world of photography. By Oliver Atwell

© ANDERSON & LOW

Anderson & Low: On the Set of James Bond's Spectre

By Jonathan Anderson and Edwin Low, with foreword by Sam Mendes, Hatje Cantz, £35, hardback, 64 pages, 978-3-77574-1-989

WHILE the character of James Bond has never disappeared from our screens, gone are the days of cringe-worthy puns and cartoonish gadgets to be replaced by a more vulnerable and recognisable hero. The uncomfortable shades of rampant misogyny and queasy colonialism are still present, but in the hands of director Sam Mendes unwelcome thematic interpretation is circumvented by proficient visuals and set pieces. In this book from Jonathan Anderson and Edwin Low we find a series of images taken on the set of *Spectre* (2015). They reveal exquisite attention to detail on the part of the designers. The images have been taken in such a way as to allow you to immerse yourself in the locations. As a record of the exhaustive work that goes into the illusion of cinema, it's impressive. ★★★★½

The Traveller

By Harvey Benge, Dewi Lewis, £25, hardback, 96 pages, 978-1-91130-602-3

OVER a period of 15 years, Harvey Benge journeyed from the South Pacific through Asia to Paris. A first look reveals a series of images that seem to be disparate; nothing more than snapshots of the kind most of us would delete. There is no qualifying essay; in fact, there's a distinct absence of text of any kind, meaning readers are faced simply with a series of images, page after page. However, the lack of context means we are free to make associations between images, interpret them, lose ourselves in them. Further, the book's title perhaps gives us all the context we need. We're seeing the world through one man's eyes, but then ambiguity sets in and we bring our own experiences and ideas to the fold. So often a series of images is supplementary to an artist's immovable statement, but this is a book from which to learn something. ★★★★★

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Digital Camera Photographer GOOD SERVICE AWARD 2016

Look sharp

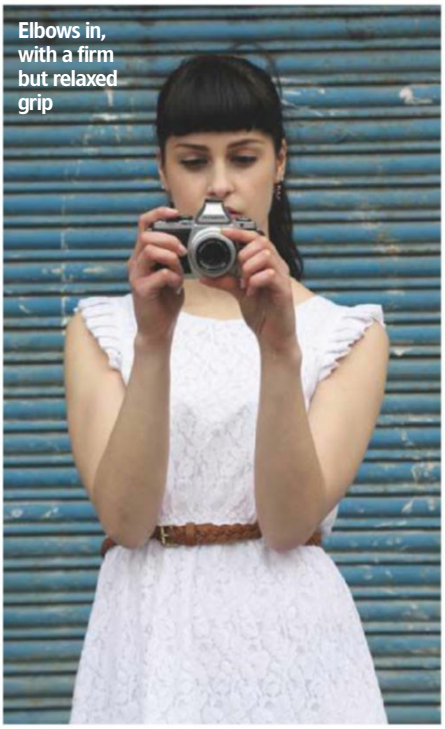
Trying to rescue an out-of-focus picture post-capture often leads to disappointment. Luckily, there is plenty you can do before you release the shutter to ensure super-sharp results

Underexposed images can often be rescued in post-production, but blurred or out-of-focus shots are not so easy to save. Of course, there are ways to increase the clarity of a slightly soft shot (see pages 34-36), but in reality all you're doing is increasing the contrast along edges detected by the post-processing software. The best way to ensure pin-sharp pictures is to do as much as you can to keep yourself and your equipment steady prior to releasing the shutter. This can be achieved in various ways, but one of the most obvious is to mount your camera to a stable support (see pages 46-49 for options), or holding it in such a way that movement is kept to a minimum. Once you are sure that everything is super steady, you can employ the services of in-built camera stabilisation or experiment with focus settings and other camera-based variables.

© STOCKPHOTO/SHUTTERSTOCK

Keep it steady
the basics

MOST blurred pictures are caused by camera shake. Even when a picture looks sharp to the naked eye, when magnified on an LCD (or computer) screen you will often find that the edges are not clearly defined or that key areas lack fine detail. In truth, there is little point in investing hundreds, if not thousands, of pounds on high-resolution cameras and pin-sharp lenses, and then throwing away all this technology by failing to keep the camera steady at the point of capture. To make the most of this hi-tech wizardry, you need to support it properly. If you don't have a tripod or other firm support, use the following tips to increase your chances of a steady shot.


Elbows in, with a firm but relaxed grip

Stand properly

It may sound obvious, but make sure that you have both feet on the ground with your weight evenly distributed. Tuck your elbows into your sides for extra stability, and hold the camera firmly with both hands.

Lean against something

Find something rigid to lean against, as it will help to counteract the natural movement of your body. Resting against a lamppost, a tree or a wall will provide extra stability.

Place your tripod on a solid surface

If you haven't got a tripod with you, try improvising. If there's a table, the top of a wall, or some other flat surface at the right height for the shot, place your camera on it.

Use a viewfinder

When you use a viewfinder, the act of pressing the camera against your head to look through the eyepiece can significantly improve stability.

Raising the camera to your eye can aid stability

Don't jab at the shutter

It can be tempting to jab at the shutter-release button, which can lead to blur-inducing movement. Squeeze the shutter slowly to avoid any jarring of the camera.

Make the most of the strap

If your camera doesn't have a viewfinder, simply put your camera strap around your neck and pull the camera away from you until the strap is taut.

Pull out the strap to help support your camera

Choosing a tripod

WE all know that the main purpose of a tripod is to keep your equipment still, but there are other, less obvious, benefits to using a three-legged support. First, it tends to slow you down: when you have to release leg locks, extend poles, and make sure that the camera is level, you often take more time over your compositions. Second, with the help of an additional arm or clamp, you can use the tripod as an assistant, holding a reflector or diffuser in place. There are hundreds of tripods on the market (for a round-up, see pages 46-49) each differing in weight, construction, height, folded length and weight-bearing capacity. Before you decide what to buy you need to bear a few things in mind.

A sturdy, well-made tripod will last you for years

Check the weight-bearing capacity

The tripod needs to be strong enough to carry the weight of your heaviest camera and lens combination.

Consider the raw materials

If you're planning to use the tripod away from home, you will probably want to consider its overall weight: carbon fibre is significantly lighter than aluminium, without compromising on strength or rigidity, but it's also much more expensive.

See how high you can go

It's important to check the maximum height the tripod can reach without the centre column being extended. Some models have an impressively compact folded length, but do not extend as high as a result.

Decide between twist or lever-lock legs

Tripod legs are released and secured via twist-locks or lever-locks. Twist-lock legs can occasionally slip, but manufacturers have been working to alleviate this problem, with impressive results.

Choose a suitable head

Whether you choose a pan-and-tilt head or a ball head is down to the type of photography you do, as well as personal preference. Ball heads allow greater freedom of movement, but pan-and-tilt heads can sometimes be more accurate because you are adjusting one plane at a time. There are other specialist heads – panoramic versions spring to mind - but these tend to be less useful for general photography.

Lever-lock legs can be faster to set up

Extending the centre column reduces stability

Using a tripod

ONCE you've chosen a suitable leg-and-head combination, you need to make sure you know how to use it properly. It might sound obvious, but when you're in a rush it can be tempting to raise the centre column before the legs, or fail to add some extra ballast in windy conditions. The following tips will help you to keep everything nice and steady.

Where possible, place the tripod on firm ground

If you need to set up on an unstable surface, such as sand or gravel, push the legs in slightly to avoid slippage. If you have ground spikes, make sure you use them.

Point one leg in the direction of your subject

It's not always possible, but you'll gain extra stability if you have a little room to stand between the two back legs.

Use the thicker upper-leg sections first

These are the strongest poles on the tripod; only use the thinner lower-leg sections as and when you need to.

Avoid raising the centre column

This part of the tripod is less stable than the legs; so only raise the centre column when the legs are already fully extended.

Add weight to increase stability

Some tripods have a hook at the bottom of the centre column that allows you to hang a weight from it, such as your camera bag. It's particularly important to add extra ballast when you're shooting in high winds.

© ISTOCKPHOTO.COM/WINDWALKER01

Adjusting camera settings

HOLDING the camera steady is the first step to achieving pin-sharp pictures, but there are many more precautions you can take to win the battle against blur. In fact, your camera already has a variety of in-built features to help you overcome vibration and shake, which include depth-of-field preview, self-timer, live view and mirror lock-up.

Focus and depth of field

Taking control of autofocus is essential for consistently sharp shots. For portraits, or situations with a static subject, choose single-point AF and carefully set the AF point over the eyes, for example. To track moving subjects, switch to continous AF (AI Servo on Canon SLRs). In situations where your AF might get confused, for example, when shooting close ups, be prepared to focus manually, using Live View zoom to help you check everything is sharp before you shoot. The depth of field (DoF) preview button is also handy for checking the zone of acceptable sharpness in a shot.

Careful camera set-up can help to keep shots sharp

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Live View zoom helps with manual focus

No release cable? Use the self-timer

Checking sharpness in live view

Whether you compose your pictures via the viewfinder or using an LCD screen is a matter of personal preference, but using an electronic screen has one major advantage: it lets you see exactly what the sensor sees. What's more, this screen allows you to magnify the image to check key areas are sharp, which is especially handy if you have chosen to focus manually. When live view is activated the mirror in your DSLR flips up to allow a clear, unobstructed view through the lens to the sensor. This prevents mirror slap from affecting the sharpness of an image (see below).

Using mirror lock-up

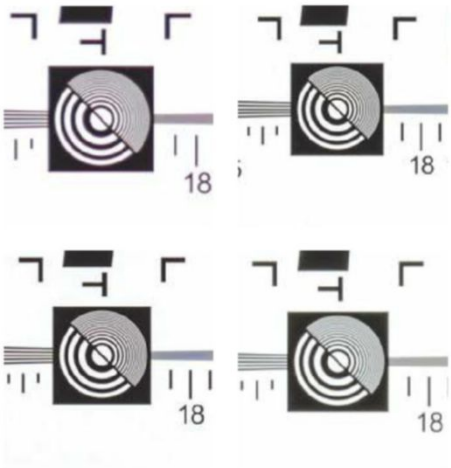
To allow light to pass through the lens to the sensor, all DSLRs have a hinged mirror that bounces light up towards the optical viewfinder. When this mirror moves it can cause small vibrations, which can affect image sharpness. With modern DSLRs it's less of an issue, but if you want to eliminate it altogether you can either use Live View or activate the mirror lock-up feature on your camera. When you use mirror-lock up, the camera flips the mirror out of the way long before the shutter is fired, which allows any vibration to die down. This is great for close-up photography, where every movement appears magnified.

Setting the self-timer

It's a common assumption that if your camera is mounted on a tripod it is rock steady, but that's simply not the case. Some movements and vibrations are so small that they go unnoticed until you view the resulting out-of-focus pictures on screen. To avoid moving the camera when you depress the shutter-release button, fire it with the self-timer feature or a remote release.

Switch to Live View to check your focusing

Lock up those flapping mirrors, too



Lens test charts help you find the sweet spot

Finding your lens's sweet spot

EVERY lens has a 'sweet spot' – the aperture at which it performs best – and it's usually a few stops down from the widest aperture. Here's how to hit the sweet spot every time.

Smaller isn't better

Don't assume that stopping the lens down will produce the sharpest image. Diffraction can be a problem at small apertures, where light rays get slightly bent as they pass through, slightly softening the image. The narrower the aperture, the more pronounced diffraction becomes.

How to test for it

To find the sweet spot on a lens, attach your camera to a tripod, switch it to aperture priority, compose your image and take a picture at the widest aperture. Now reduce the aperture by one stop and repeat the exercise. Keep going until you reach the minimum aperture. Then upload your images to a computer, magnify the same area by 100% and check the EXIF data for each file. You'll soon see which aperture provides the sharpest results.

Don't get obsessed

While knowing about the sweet spot is helpful, don't get hung up on it. Different scenes and subjects call for different aperture and shutter speed combinations, so don't let an obsession with sharpness override your creative intentions.

Calculating the hyperfocal distance

ONE way to maximise DoF (and increase the zone of acceptable sharpness) is to calculate the hyperfocal distance. Don't worry, it's not as scary as it sounds.

Use a smartphone app

Use online calculators and apps to do the maths for you. We like the free DOFMaster (www.dofmaster.com).

It couldn't be easier

Simply enter the make and model of your camera, input the focal length of the lens, fill in the chosen aperture and enter the camera-to-subject distance. Press 'calculate' and the program comes back with all the information you need to guarantee front-to-back sharpness in your shot.

© ISTOCKPHOTO.COM/KANONSKY

Focus peaking

MOST cameras now offer both manual and automatic focusing. There will always be times when manual focus is preferable – when faced with a low-contrast scene or when shooting in low light, for example – but it can often be difficult to tell when key areas are entirely sharp. This is why some cameras offer focus peaking.

Contrast detection

When you focus the lens manually, the camera measures subject contrast. It lets you know which areas are showing the greatest contrast (appear the sharpest) by marking them with a highlight or colour.

Increase in highlights

This highlight or colour increases as the subject is brought into focus, until typically the subject is covered in the markings. At this point the subject is deemed to be in focus. Easy!

Selecting an appropriate shutter speed

MODERN image stabilisation (IS) systems make it easier to achieve sharper shots when handholding, but you still need to know which shutter speeds will be fast enough to avoid blur when there's no stable support. Here are some helpful tips.

Speed and length

A good rule of thumb is to match the shutter speed to the equivalent focal length of the lens you're using. So if you're shooting with a 50mm lens on an APS-C DSLR (which results in a 35mm/full-frame focal length equivalent to 75mm), you will need to use a shutter speed of 1/75sec or more to safely handhold the camera.

Magnified movement

Remember that longer lenses will require faster shutter speeds because at longer focal lengths, any movement will appear magnified.

Don't forget IS

If you have IS built into your camera or lens, turn it on as it gives you more leeway when shooting handheld, particularly in low-light conditions. For a complete guide on the different types of IS and how to make the most of it, see the feature on pages 21-25.

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LETTER OF THE WEEK

Recognising faces

I'm writing about Terry O'Neill's picture of the Rolling Stones titled 'Soho, London, 17 January 1964', which appeared in AP 11 June (see right). I was amazed when I recognised the person in the background: the balding chap standing on the back of the lorry outside the Tesco warehouse. That picture took me back to when I joined Tesco as a 23-year-old lorry driver in 1967. The chap's first name was Ron, but I can't remember his surname. This picture is very relevant to me because it was around this time that I first became interested in photography. I remember my first camera being a Halina that I managed to get caught in my car door after a shoot at a Tesco football match, thus rendering it useless; I then went on to buy many different cameras, mostly SLRs, over the years and have ended up with a collection of 33 Nikons including my current Df. Thank you so much for the memory jogger and the great magazine. Keep up the good work.
Alan Culley, Hertfordshire

Soho, London, 17 January 1964, by Terry O'Neill

©ICONIC IMAGES/TERRY O'NEILL

I'm not sure what impresses me most, Alan: the fact that you recognise the man in the background of one of O'Neill's Rolling Stones pictures, or that you have 33 Nikons. Fit your living room out with wood panelling and some glass cabinets and you could be Hertfordshire's answer to Grays of Westminster! – Nigel Atherton, Editor

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Genre theory

I was interested in the article by Professor Bob Newman on genre and photography (AP 25 June) as I have thought for some years that there is a camera club genre of photography. Most of the readers' pictures in AP conform to it. If I stick to the genre, I do reasonably well in our club's competitions. But when I try to push the envelope a little and enter a picture that I think has something original to say, I am invariably disappointed. Usually the judge does not understand what it's about, doesn't know what to say and marks it down.

I know it's because I am not communicating by failing to meet the judge's expectations. That's my excuse, anyway, for being so low down on the competition leader board!
David Pelling, Surrey

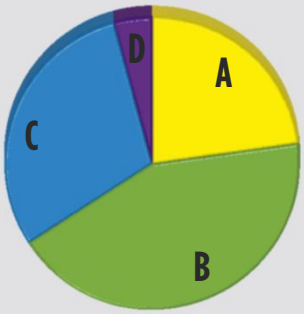
David, I'm very pleased that you found the article helpful in understanding the reasons for your occasional lack of success. If this were a theory in the physical sciences, one could run the numbers and find out the optimum amount to push the envelope. Alas, since it isn't, you just have to learn the hard way – Professor Bob Newman

Consistent AP

I want to thank AP very much for the good service the magazine consistently provides. AP is a very interesting and informative magazine. I've learned vast amounts from it over the years, and I'm continually impressed by you and your team's ability to produce it weekly – that's no mean feat!

I'm an AP subscriber, and your latest offering usually comes through my letterbox on a Saturday morning, which enables me to sit down with a few excellent Belgian beers on a Saturday afternoon. I'm retired and have the rest of the week to do other things, so Saturday afternoons relaxing with AP are much looked forward to. And, as if this weren't enough, I've noticed that when bank holiday weekends are upon us, you manage to get AP to me on the Friday before the break rather than the Tuesday or Wednesday after, so I can enjoy AP over the weekend. That's very good service.

Finally, I recently sent a query to *Technical Support*, expecting that I'd have to wait until the answer appeared in AP, if it were published at all. The issue was moderately urgent,



In AP 2 July we asked...

What percentage of your photo equipment is second-hand?

You answered...

A 0%	**23%**
B 1-49%	**43%**
C 50-99%	**30%**
D 100%	**4%**

What you said

'About 75% of my photographic equipment was bought second-hand as I don't have much money. I tend to think of my Canon EOS 40D as my "new" camera, but was staggered to realise that it's nearly nine years old! However, it still works faultlessly and takes great pictures, so I see no reason to change.'

'Nearly all of it!'

'I have a lot of second-hand film cameras and lenses, but they are hardly used now. Digital ones are mainly new, although I usually wait until the new model comes out and pick up a reduced-price old model. The lenses I've bought to replace the kit ones are generally second-hand.'

'About 10%. I prefer to buy new.'

This week we ask...

Do you apply sharpening to your images in post production?

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Tweet of the week

Manfrotto UK @manfrotto_uk

In the world of nature photography, there's always room for improvement. In this image by Aaron Northcott we see the true value of achieving sharpness in your images.

© AARON NORTHCOTT

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although I didn't mention that in my email. I was extremely pleased to receive a very prompt and informative email reply from Andy Westlake. Now, that is service!

So, well done to all of you at AP – you are doing outstanding work.
Adrian Lewis, Bristol

Thank you, Adrian! If you ever wanted to bring a crate of Belgian beer into the office as a thank-you gift, that would be really appreciated – Richard Sibley, deputy editor

AP's biggest fan?

My dad, Roy Waddleton, turned 80 years old on 13 July. He has been an avid amateur photographer for as long as I can remember and has been collecting AP since 1962, treating every copy like a treasured possession! He is an Olympus man through and through, and has a considerable collection spanning decades. The transition from film cameras to digital was not an easy one for him, although he rarely uses anything else these days and is always keen to explain in lengthy detail how he shoots in raw.

Dad's passion for photography is unrivalled and he is actually quite good at it.

© MICHELE SKENNERTON

Avid photographer Roy Waddleton has been reading AP since 1962

He is, I would say, one of your number-one fans.
Michele Skennerton, via Facebook

You've been reading AP since before I was born, Roy! I hope you had a great birthday – Nigel Atherton, Editor

Candid wedding shots

Wedding photography is one of my interests, but it's also one I've felt to be slightly out of my reach as I thought I didn't have the 'required' equipment. However, I recently traded my Nikon DX equipment (D300S and D7000 cameras with Nikkor 17-55mm f/2.8 and Tokina 11-16mm f/2.8 lenses) for a D700 with 35mm and 85mm primes, and I've found that I am enjoying my photography a lot more with the benefits of low ISO sensitivities and faster shutter speeds. And after reading the feature *Telling wedding stories* by Kevin Mullins (AP 11 June), it has encouraged me to pursue this candid style of wedding photography, as I'm more suited to this shooting style and love to travel light.
Peter Murrell, London

It's great to hear that one of our features has inspired you to try a different approach to the way you photograph weddings. Good luck with your photography in the future – Michael Topham, deputy technical editor

In next week's issue On sale Tuesday 26 July

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Printed in the UK by the Wyndeham Group
Distributed by Marketforce, 5 Churchill Place, London E14.
Telephone 0203 787 9001

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Shooting at 1/8sec has blurred the movement of the pedestrian but the stabilisation system has helped keep the surroundings sharp

Rock steady

Once you understand its stabilisation system, you'll be able to handhold your camera with confidence. **Angela Nicholson** explains all

From holding their breath to leaning against walls, photographers have lots of tricks for getting sharp images when they're handholding their cameras. Thanks to technology their images could be sharper still, however. Most camera systems have some form of stabilisation system that's designed to compensate for those tiny shakes and wobbles that occur when you hold a camera.

If you mainly shoot using wideangle lenses, you might be wondering what all the fuss is about, but pop a long telephoto lens on your camera and it becomes obvious. At very long focal lengths, it can be hard to keep even a stationary subject in the frame because very tiny movements of the camera are accentuated. It's a feature of the smaller viewing angle of telephoto lenses compared with wideangle optics. A 24mm lens, for example, has a horizontal angle of view of around 74°, but a 200mm lens covers just 10° making a 1° movement of the camera much more significant.

Of course, it's not just the framing that's affected; camera movement can also cause image blur. Also, because the movement is more significant with telephoto lenses, the degree of blur is also more dramatic. It's the reason you should use faster shutter speeds with longer lenses.

Stabilisation systems

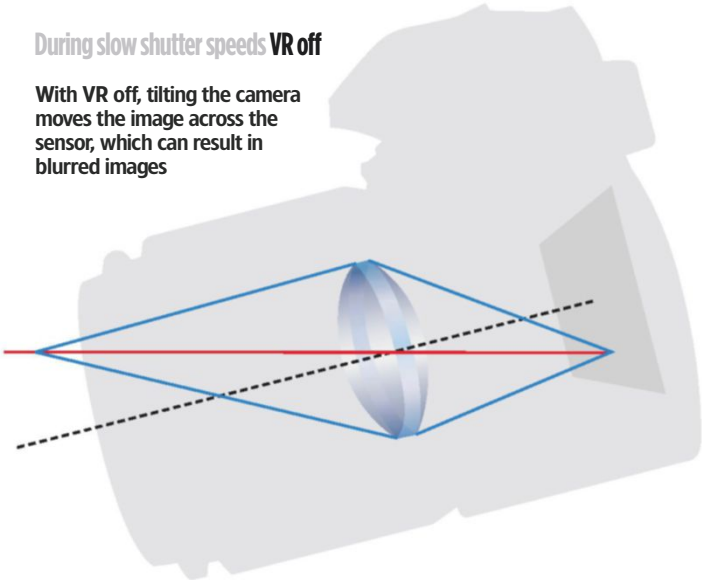
The first stabilisation systems for photography were developed for use with film cameras, so they were built into lenses – it's easier to move a lens element than it is to shift a 35mm film frame inside the camera. Although Canon is credited with introducing the world's first stabilised interchangeable lens in 1995 (in the Canon EF 75-300mm f/4-5.6 IS USM) and Nikon had the first stabilised lens in a compact camera a year earlier, it was actually Panasonic that developed the first stabilisation system, and it was for a video camera.

The basic principle of a lens-based stabilisation system is that there's a floating element (or group of elements) that can shift to compensate for small camera movements and so keep the image projected onto the same part of the film or sensor. In practice, it's a little more complex than having a lens element on a gyro; there are movement detectors that need to determine the magnitude, speed and direction of any camera movement. A microcomputer in the lens then calculates which direction the stabilisation element needs to move, how far and at what speed before relaying this information to the stabilisation unit, which is then moved. This all needs to happen very quickly to be effective and, naturally, some power is required from the camera battery.

The development of digital cameras has given rise to another means of stabilisation: sensor-based. Instead of an element within a lens moving,

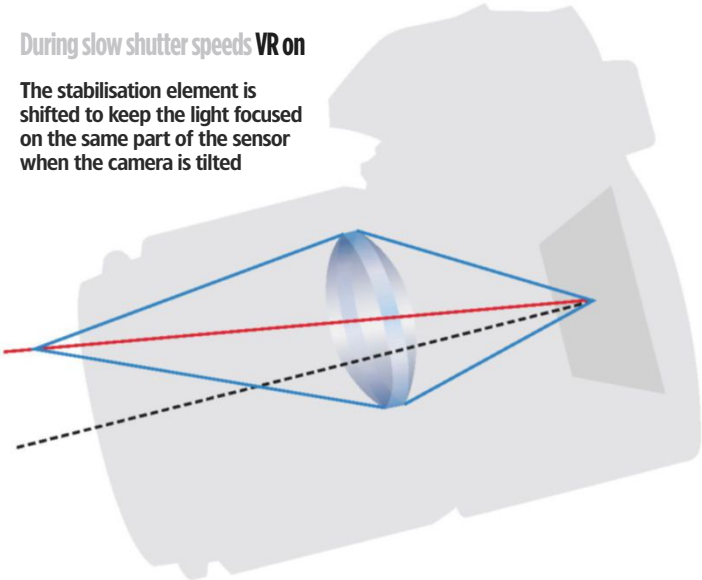
During slow shutter speeds **VR off**

With VR off, tilting the camera moves the image across the sensor, which can result in blurred images



During slow shutter speeds **VR on**

The stabilisation element is shifted to keep the light focused on the same part of the sensor when the camera is tilted



Systems compared

Lens-based stabilisation

Pros	Cons
Works with all compatible cameras	Makes lenses more expensive
Correction visible in SLR viewfinder	Makes lenses heavier
Wider area of correction – good for telephoto lenses	Usually works across just two axes
Bespoke to the lens in question	Bokeh quality can be reduced

Sensor-based stabilisation

Pros	Cons
Works with all mountable lenses	Makes cameras thicker and slightly heavier
Works across several axes	Makes cameras more expensive
In some cases can work with lens-based systems	Correction not visible in SLR viewfinder
No negative bokeh effect	Has to work with many lenses

Who does what

Manufacturer	System name	System type
Canon	Image Stabiliser (IS)	Lens-based
Fujifilm	Optical Image Stabilisation	Lens-based
Nikon	Vibration Reduction (VR)	Lens-based
Olympus	Image Stabilisation (IS)	Sensor-based, but dual introduced
Panasonic	Optical Image Stabiliser (OIS)	Originally lens-based, but dual introduced
Pentax	Shake Reduction (SR)	Sensor-based
Sony	SteadyShot (SS)	Sensor or lens-based depending on camera
Sigma	Optical Stabiliser (OS)	Lens-based
Tamron	Vibration Compensation (VC)	Lens-based

the imaging sensor shifts to compensate for involuntary movements. As with lens-based stabilisation, sensors are required to detect the direction, speed and magnitude of any movement before the processor can determine the degree of compensation that is required and the sensor can be shifted accordingly.

Greater compensation is required with longer lenses, and usually the camera can detect the focal length of the lens that is mounted to enable it to apply the correct level. If it is unable to do this, it is usually possible to specify the focal length manually via the camera menu.

Olympus, Panasonic and Sony have now started to use both in-camera and lens-based stabilisation together. These dual-stabilisation systems allow the camera to use the most appropriate form of compensation according to the subject and mounted lens. With telephoto optics, for example, the lens-based system offers a wider range of correction. Meanwhile, with macro photography, horizontal and vertical movements are more of an issue requiring sensor-based stabilisation. A dual system means that pitch and yaw can be corrected at the same time as rotational and linear correction.

Lens-based vs sensor-shifting stabilisation

With SLRs, one of the main benefits of a lens-based stabilisation system is that the correction is visible in the viewfinder. This makes the subject easier to see and the framing more consistent. With early systems, some photographers find looking at the dampened movement can make them feel dizzy but more recent systems are better and give a more stable view.

SLRs have an optical viewfinder so the

The small red circle in the centre of the frame represents a 1° angle of movement

Shooting with the Nikon AF-S Nikkor 80-400mm f/4.5-5.6G ED VR at the 400mm end, I managed an absolutely sharp hit rate of 2/10 without VR and 7/10 with VR at 1/40sec. Even at 1/13sec I had a hit rate of 5/10 with VR activated, but dropping to 1/10sec reduced my hit rate to 1/10

impact of a sensor-based stabilisation system isn't visible. Compact system and Sony single-lens translucent (SLT) cameras use the live view feed from the imaging sensor for their viewfinders, so the viewfinder image is stabilised.

Another advantage sometimes claimed for lens-stabilisation is that it makes the camera bodies less expensive and the stabilisation travels with the lens, allowing it to work with any compatible camera. The downside, however, is that the lenses are more expensive and heavier. Manufacturers of sensor-based systems would also point out that including the stabilisation in the camera body means the system is transferable to every lens.

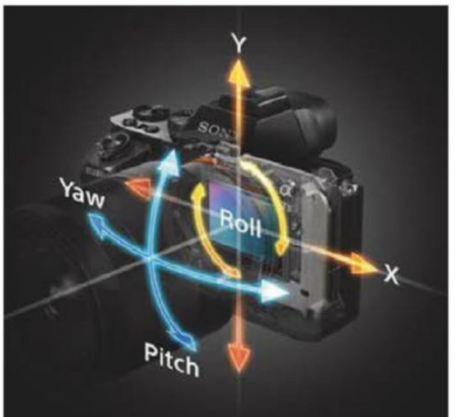
Because the stabilisation element within a lens moves the light path so it may be closer to one side of the iris, there can be a drop in the quality of the bokeh. This doesn't happen with a sensor-based system, as the light passes through the lens along the normal path.

Although sensor-based stabilisation is very effective, the sensor can only make relatively small movements, limiting its effectiveness with long telephoto lenses. As mentioned earlier, this is part of the reason Olympus, Panasonic and Sony have introduced dual-stabilisation systems that can take advantage of both lens element and sensor-shifting mechanisms.

In 2010, I carried out an in-depth assessment of lens- and sensor-based stabilisation systems and concluded that lens-based systems performed slightly better. Six years on and the tables have turned: sensor-based systems offer more axes of correction.

The pros and cons of the two main types of systems are an academic discussion because each manufacturer has its chosen mechanism. Even where the

At 100mm that 1° angle covers a larger area. This shows how camera shake is amplified by tele lenses



Shake, wobble and roll: the facts

WHILE the first sensor-based stabilisation systems only corrected movements in two planes, the most recent systems from Olympus, Pentax and Sony work across five, but what are they?

PITCH This is an up-and-down tilting or rotational movement as the camera pivots in the hands. It's most apparent at the farthest end of the lens. It's a common form of movement with large, heavy lenses, especially after they've been held for a long time and the arm muscles start to tire.

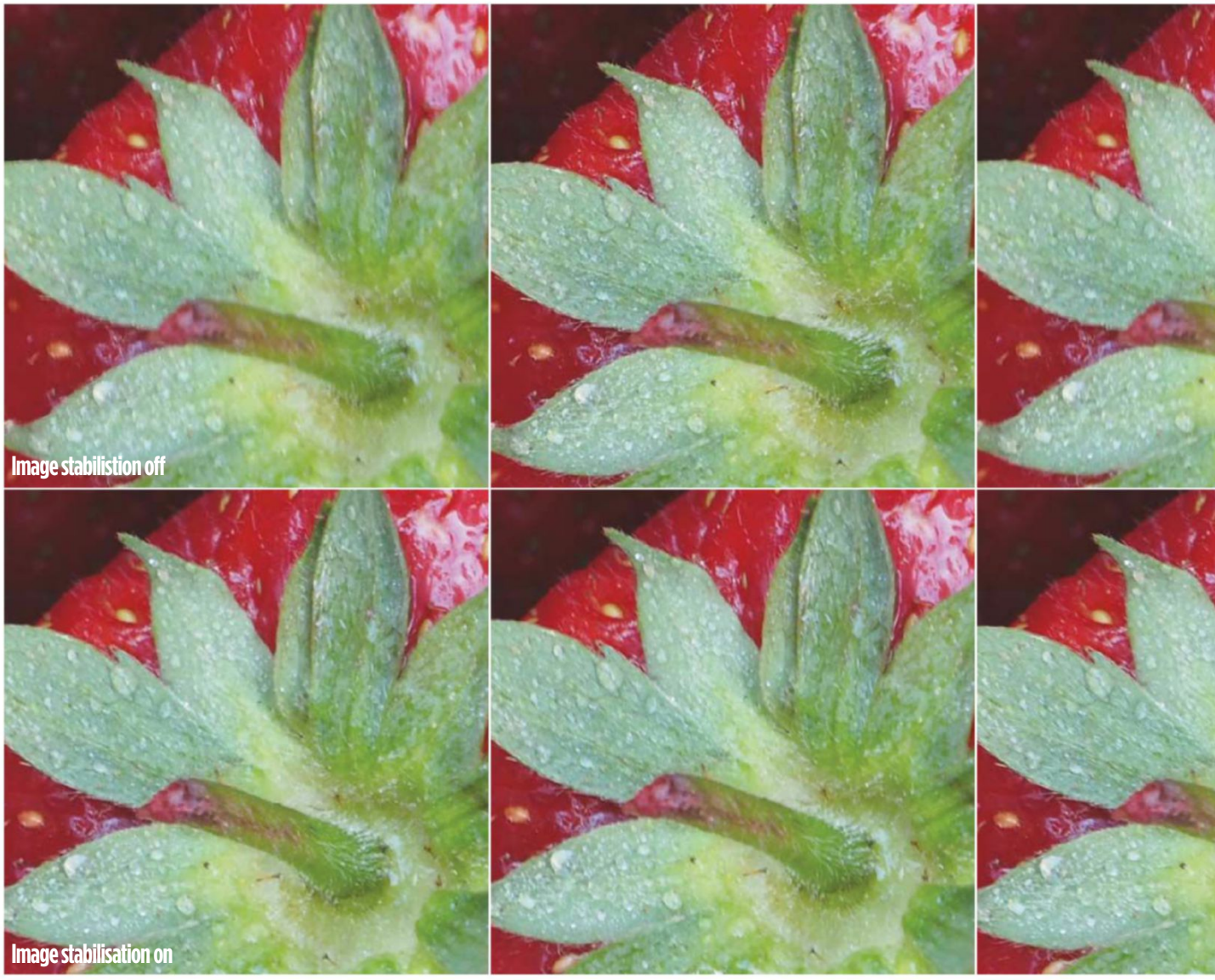
YAW This movement is similar to pitch but it's a rotational side-to-side shift. Again, lens length and weight are factors. Strong winds can also increase the likelihood of yawing with long lenses.

ROLL A rotational movement around the sensor. It can be caused by pressing the shutter release and can be reduced by squeezing rather than jabbing at the button.

HORIZONTAL OR X-AXIS A linear side-to-side movement where the camera is shifted parallel to the subject rather than pivoted around a point. It's most commonly associated with macro photography, when very small movements can have a major impact upon the sharpness of the image.

VERTICAL OR Y-AXIS An up-and-down linear movement that's similar but perpendicular to X-axis movement. It's also usually a feature of macro photography.

FORWARDS/BACKWARDS As yet, no system can correct for movement that's backwards and forwards from the image plane. It's most noticeable when shooting handheld macro subjects as the slight change in subject distance has a dramatic impact upon focus.



Olympus OM-D E-M1 with 12-50mm lens at 50mm, 1/25sec. The five shots with IS turned on (lower row) are consistently sharper than those without (top row), but are not all equally sharp

camera can use a dual-stabilisation system, the photographer cannot usually choose to use one over the other. Also, third-party lens manufacturers tend not to include their stabilisation mechanism when the manufacturer offers a sensor-based version.

Why and when to use it

There are many articles extolling the virtues of using a tripod and lengthy explanations about how to get super-sharp images, but the fact remains that a tripod is still a pain to carry.

Noise control is far better today, so stepping up the sensitivity setting can help keep shutter speeds within a safe handholding range. However, there are still limits, and activating your camera's stabilisation system is a good way to ensure you get sharp images as light levels fall.

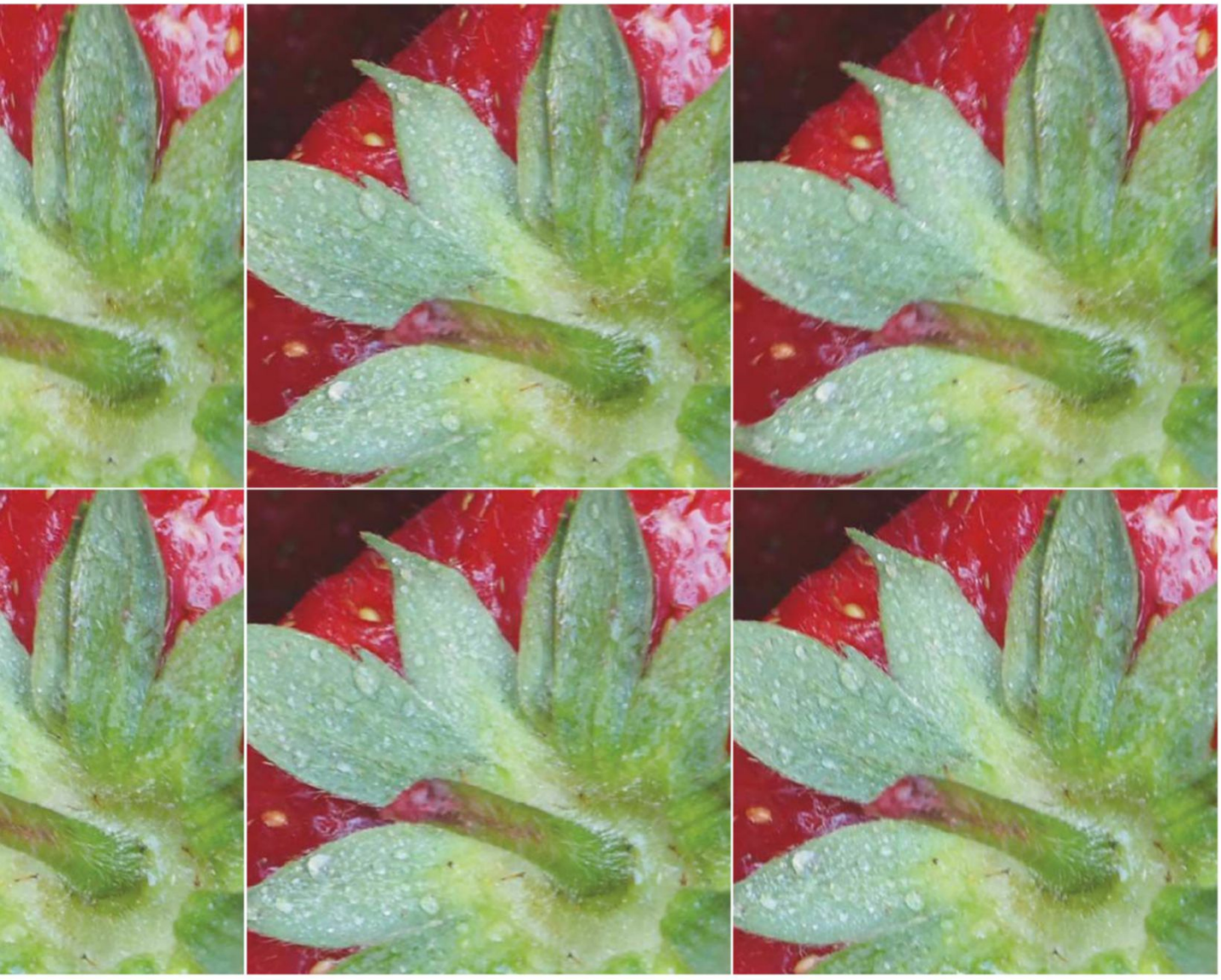
Unless you're concerned about preserving battery life, I'd recommend you keep your camera's stabilisation system on for general handheld shooting. Nikon claims its recent Vibration Reduction (VR) system can detect when a camera is mounted on a tripod; even so, it's wise to turn a camera's stabilisation system off when it's on a tripod.

How low can you go?

The general rule for handholding a camera is that you should use a shutter speed that's at least one second divided by the 35mm-equivalent focal length of the lens. This means that with a 100mm lens on a full-frame camera you should use a shutter speed of at least 1/100sec. With an APS-C format camera you need to take the focal length magnification factor into account and use a shutter speed of at least 1/150sec – making 1/160sec the logical selection if your camera is set to 1/3EV adjustments.

Manufacturers describe the performance of their stabilisation systems in terms of the number of exposure values (stops) that the shutter speed can be reduced below the accepted safe handheld value and still produce a sharp image. Values such as 3, 4 or even 5EV are quoted. A 3EV reduction in the shutter speeds mentioned earlier works out at around 1/13sec with a full-frame camera and 1/20sec on an APS-C format model.

However, these performance values are calculated using lab-based measurements – following CIPA (Camera & Imaging Products Association) guidance – with the camera on a vibration plate that's designed to recreate 'typical' camera shake. The actual safe value varies from person to person depending upon a variety of factors, including how much coffee they've



drunk. It's worth investigating how low you can drop your shutter speed with and without the stabilisation system active.

Set the mode

Some stabilisation systems offer different operating modes. Nikon usually offers two: Normal and Active. Normal is used for most situations, including panning, while Active is used when shooting from an unstable platform such as car.

A few Canon lenses have three modes but most have one or two. Mode 1 is the general-purpose option, while Mode 2 is for panning with the camera in horizontal or vertical orientation. Mode 3 is available on some recent long telephoto lenses. It's like Mode 1 but the IS is active only when the shutter release is pressed home fully so that it can apply the most compensation.

Some brands control lens IS modes from the camera, and you'll have to remember to select panning mode in the menu. A similar rule applies to cameras that use in-body stabilisation, so familiarise yourself with the options and make sure you set them appropriately.

Find **your limit in nine easy steps**

DISCOVER your safe handholding shutter speed with and without image stabilisation by shooting a subject and gradually reducing the shutter speed, following these steps:

1 Find a suitable target that has lots of fine detail (a sheet of newspaper stuck to a wall is ideal) and photograph it from the typical distance that you would use for the mounted focal length. Begin with the stabilisation system turned off and use a shutter speed that's one second divided by the focal length: for example, 1/100sec with a 100mm lens on a full-frame camera, or 1/160sec on an APS-C format model.

2 Shoot ten images. Most of them (if not all) should be perfectly sharp.

3 Reduce the shutter speed by 1/3EV and shoot another ten images before reducing the shutter speed again and repeating the process.

4 Keep reducing the shutter speed and shooting until it's obvious that all/most of the images in the sequence of ten are blurred.

5 When you've finished, repeat the process with the stabilisation system active.

6 Examine the images on a computer, beginning with the slowest shutter speed shots. Start by checking each image at screen size and make a note of how many in each batch of ten look acceptable – this is your screen-size hit rate out of ten.

7 Next, zoom into 100% or 'Actual Pixels' and check each image again. Open the images taken at the fastest shutter speed and see how they compare.

8 Make a note of how many images are completely sharp at 100% – this is your absolute hit rate out of 10.

9 If all of the images you have taken at a particular shutter speed are sharp, you know that you can use that for individual shots. However, you can use your hit rate to work out how many shots you need to take to get a sharp image at slower shutter speeds. If 5 out of 10 shots at 1/5sec are sharp, you know one out of two images is likely to be sharp. One sharp image out of 10 means you need to shoot 10 to have a keeper.

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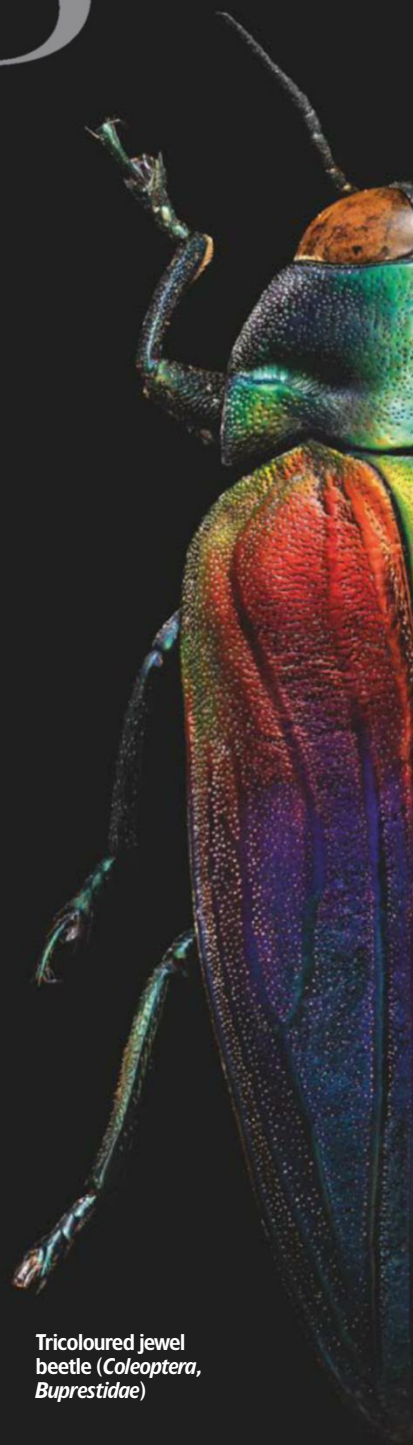
Lord of the wings

Splendid-necked dung beetle (*Coleoptera, Scarabaeidae*)



Tricoloured jewel beetle (*Coleoptera, Buprestidae*)

Levon Biss has spent more than two years creating stunning insect portraits using a unique microscopic shooting set-up, as he explains to **Steve Fairclough**

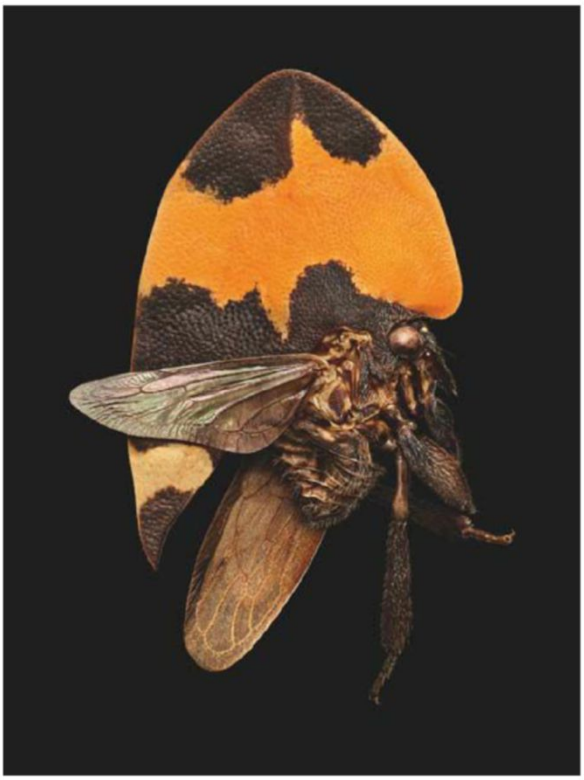
A 'normal' working day for Levon Biss would usually see this talented photographer shooting portraits of actors or a commercial campaign for a sports-clothing manufacturer – but he hasn't had too many normal days recently. The reason for this is his current obsession with shooting microscopic portraits of insects in his home studio, a project that sits nicely under the banner 'Microsculptures'.

'Outside of my commercial work I've always got personal projects on the go, but I don't put those out there,' says Levon. 'It's a tricky one, because you get pigeonholed – my pigeonholes are sports, portraits and celebrity. If you throw work out there that is off at a completely different angle, it just confuses clients, because people come to me for a specific type of image.'

This personal venture began when Levon was dabbling around with macro, and then his son found a little ground beetle in the garden. Levon took the specimen up to his studio to have a look at it. Once he put it under his microscope and started studying it, it suddenly dawned on him how beautiful these creatures are up close.

Tiger beetle (*Coleoptera, Carabidae*)

ALL PICTURES © LEVON BISS



'Insects are around us all the time, but you don't really notice or think what they would look like if they were our size,' says Levon. 'So I decided to photograph it for my boy really. That was the first one and after that it was "insects only" for me.'

Above: Treehopper (*Hemiptera, Membracidae*)

Right: Wasp mimic hoverfly (*Diptera, Syrphidae*)

Insect collection

Levon kept on shooting insects he found in his garden and refining his techniques – then he decided to set up a meeting at the Oxford University Museum of Natural History to see if it might allow him to source specimens from its extensive insect collection. As Levon explains, 'I showed Scott Billings [the Museum's communications expert] some of the images on my computer – he liked them but I kept on zooming in further and further to the images and he went a little bit quiet. I don't think they'd seen anything like it before. At the time I wasn't really that aware if I was shooting anything special or not, as it was just something I'd done as my work.'

It turns out Levon's project was something that hadn't been done on this scale before. As soon as Levon presented his project, the museum allowed him open access to their collection. Scott Billings introduced Levon to an entomologist called Dr James Hogan, and the two joined forces to develop and expand the project.

'That's essentially where "Microsculpture" – the brand or title – came about,' Levon continues. 'Microsculpture is really a technical term that is used by entomologists to describe the shape and structure of insects and the way they adapt to their environment.

'In a lot of ways, the project was a way of encapsulating art and science, as Dr Hogan would source insects that he thought were scientifically valid and had a story behind them. I'd come at it from an artistic and creative point of view as to how these things looked, and how I could work with them with my lighting techniques. We sort of met in the middle – we'd get a wider range of specimens and cull them down to the ones that we thought would work, and that's how it went on.'

Opposite: Jewel longhorn beetle (*Coleoptera, Cerambycidae*)

Set-up and workflow

With the museum's entomology experts on board, it was then a case of arranging regular pick-ups of insects and embarking on the labour-intensive shoots. 'In reality I wouldn't say there's anything technically special that I do,' says Levon. 'It's one of those things where people think that there's a magic tool I use or there's a certain piece of equipment that makes this happen, but I taught myself all these procedures and anyone could do it really. It's just a matter of application, time and perseverance.'

In his home, Levon set up a desktop studio arrangement where he could shoot pinned insects using a DSLR, a prime lens to go between a microscopic lens and the camera's sensor, and a digital, automated rail system to move focus backwards and forwards in increments as small as one micron (that's just 0.001mm).

'The way I work is that I'll take an insect but I'll break it down into somewhere between 20 and 30 sections,' says Levon. 'I'll treat each one of those sections like a small still life. If you think about the eye of an insect, it's very dome-shaped, it's quite smooth and there are lots of different sections to it. So you treat it with an appropriate lighting style to make that one section look as good as it can. If you're photographing a hairy leg, or something like that, the same

lighting set-up wouldn't work because it's a different shape, texture and colour, so you change the lighting set-up completely just to suit that one area. You do that over the entire body and you break down the body into different shapes, sections and textures and then change your lighting set-up for each little bit.'

Levon's lens goes in fairly close to the insects, as some of them are only 10mm long. This means each one of those sections is probably no more than a fifth of a millimetre high. However, each subject has its own bespoke lighting set-up, so that Levon can make that single section look as good as it possibly can. Then he brings all those sections together afterwards in post-production to form one image and, as he says, 'That's what makes these images "pop" a little bit more.'

Microscopic lenses

Arguably the key to the set-up is the microscopic lenses. 'Certain microscope lenses are called "infinity lenses" – for non-infinity lenses you need a bellows system to focus, so there are all those intricacies in this work,' Levon explains. 'The actual lens that goes between the microscope lens and the sensor doesn't have to be that special – I've bought some of them for £40 from eBay, 40-year-old 200mm prime lenses that have

no other real purpose than moving the microscope lens away from the sensor. You're not really using the optics inside that prime lens – it's just a vehicle to position the microscope lens.'

So how does Levon shoot each insect? 'You just work your way across. For example, you're on the eye – each section is the best part of 600 to 700 images. The camera moves forwards in around 10 micron increments between shots. You can sort of gauge your light and how it's looking, but when you're looking through a microscope lens your depth-of-field is so shallow, a lot of the time you're lighting the shot fairly blind, so it comes from experience.

'Sometimes you might get to day four or five, when you start processing all this information and start flattening down all the files. Then you get one file that is fully focused front to back. [There were a] number of insects I've done five days work on, realised it's not really working, and then had to scrap it. It's a lot of work to bin, but that's just the nature of the process.'

On average, Levon spends about three days shooting each insect. He estimates that to get to a finished, edited file – usually between two and six gigabytes – can take around two weeks per picture. 'You end up with 20 to 30 different sections of the insect all flattened down and then you've probably got another week of post-production. Photoshop is the main tool to bring it all together and you've got different focus stacking software such as Helicon or Zerene Stacker. To capture the actual images I run it all through Capture One.'

The printing process

When it was decided to hold an exhibition of the results at Oxford University's Museum of Natural History, Levon turned to his favourite printing house, Genesis Imaging, to produce the large-scale prints for it. 'I've known Genesis for the best part of 15 years. I like them because they put as much attention and detail into their prints as I do into my photography. The printing stage is one of the end results and you need to find somebody who's going to care about your work. A lot of blood, sweat and tears goes into these images and you're not going to hand it to somebody who doesn't show it the same sort of respect.'

According to Levon, the printing went smoothly, 'It's quite a rare scenario but the images that were printed are straight images from the file – we didn't balance them or adjust them in any way in the printing stage. Usually you'll make some tweaks here and there but it all comes down to the fact that as a photographer you've got to supply the printer with the file at the best quality you can get – you shouldn't rely on the printer to make it look good afterwards.'

Above: Orchid cuckoo bee (*Hymenoptera, Apidae*)

Levon Biss is a commercial, advertising and portrait photographer who is probably best known for his celebrity portraits and sports-oriented commercial work. He has worked for more than two years on his personal project 'Microsculpture'. The initial results are currently being exhibited at the Oxford University Museum of Natural History until 30 October 2016 and may become a touring exhibition after that. To find out more go to **www.levonbiss.com** or **www.microsculpture.net**

Outcome and next steps

The result of his first two years of work on this project is the exhibition showing at the Oxford University Museum of Natural History until 30 October 2016. Levon also has plans for an accompanying book in 2017 and possibly a touring exhibition. 'Probably the most satisfying thing is seeing people's reactions to it,' he says. 'Recently, I was picking the kids up from school and a couple of mums came bundling over to me across the playground all childlike and excited – they'd just had a ladies' day out to Oxford to go and see the exhibition, and had come straight from the museum. They were so excited, positive and enthused by it all; it's things like that that make it work for me.

'One of the main things I realised is that the insects didn't look scary. I think we are hardwired in some strange way to think that insects are scary – one of the main objectives I wanted to achieve at the start of this project was to not have that cliché attached. These insects and prints should be beautiful, and I think that's worked. Even at three metres wide they're not scary; they're stunning and hopefully people can come away with a bit more respect for the creatures. Maybe the next time you get a creepy crawly on your kitchen floor you'll scoop it up with a piece of paper and put it outside rather than stamp on it – that'd be nice.' AP

HOW LEVON BISS CREATED HIS MICROSCULPTURE PICTURES

1 Sourcing insects

Thanks to his ongoing relationship with the entomologists at the Oxford University Museum of Natural History, Levon makes a choice of subjects based on a combination of the scientific significance of an insect and his more artistic, creative viewpoint as to how the subjects look and how they will photograph.

2 Pinning

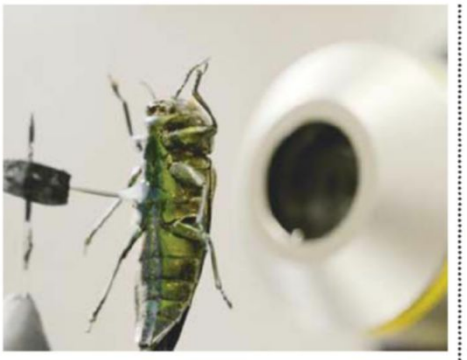
Levon asks the scientists to pin the insects in a specific way. 'Usually a pin would go straight through the body,' he explains. 'Sometimes it was actually hidden within the body. Then I attach that to another pin on a right angle, which goes on putty and hangs the insect in front of my camera.'

3 Studio set-up

Levon has a tabletop set-up that is lit depending on the insect being shot and the part of that insect being shot. 'The lights you're shooting with have to have quite a fast flash duration. Obviously everything has to be stable – there can't be any vibration, so I generally shoot a lot of my images with a shutter delay.'

4 Equipment

Levon shoots with a Nikon D800 DSLR fitted with a prime lens, usually between 160-200mm, and then a microscopic 'infinity' lens is fitted to the front of the prime optic. A digitally controlled automated rail system lets him adjust the lens-to-subject distance in one-micron (0.001mm) increments.



5 Shooting sections

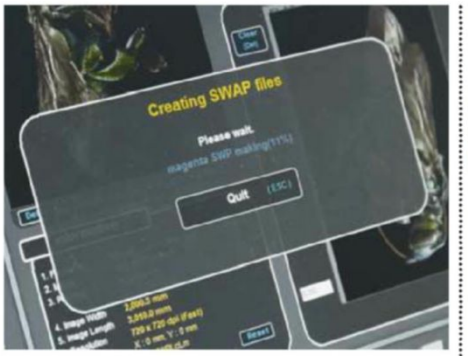
Levon divides every insect into small sections – each no more than 1/5mm high – that are lit specifically. He shoots around 20-30 different sections for each insect and estimates that around 600-700 images are in each section. His final images tend to comprise between 8,000 and 10,000 images.

6 Checking results

Once Levon has shot all the sections of an insect he checks the results to ensure focus and lighting is correct across the whole body. Because of the nature of the microscopic work, this can sometimes result in reshooting a part, or parts, of an insect in order to get a more uniform, accurately focused result.

7 Post-production

Levon flattens his images to check all technical aspects and then, using Photoshop and focus stacking software, he creates final image files. He adds, 'I don't really believe in sharpening too much – if you haven't got it sharp in-camera, then don't bother.' His final image files range in size from 2GB up to 6GB.



8 Test prints

Once Levon is happy with his final images he takes them to his long-time favourite printing house, Genesis Imaging. 'We do a lot of tests on different, smaller sections beforehand – maybe 20x20in tests – and then once you're happy that all the different elements are working, you go for the big thing.'

9 Final prints

When Levon and the team at Genesis are happy with the test prints, a final print is produced. These can often be approximately 3x2m and take around 45-50 minutes to print. More than 20 of the final prints are being exhibited at the Oxford University Museum of Natural History until 30 October 2016.

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At the sharp edge

Sharpening your image is a vital finishing touch when processing raw files. Here's how to go about it

Sharpening is an essential step in the editing workflow, as the actual image recorded by your camera is not necessarily the sharpest result you'll be able to achieve. However good your technique or lens, nearly all digital images will benefit from some sharpening in software.

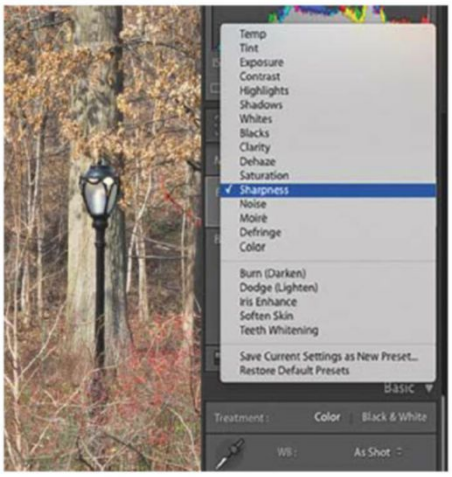
Put simply, sharpening works by slightly blurring a version of the original image to create a mask, which is then subtracted away from the original image to detect the presence of edges. By increasing the contrast along these edges, you can achieve a sharper final image.

When correctly applied, sharpening can really benefit your image, but the trick is to know how much of it to apply. Less is often more here. It may be tempting to oversharpen your image, but telltale halos can appear around the edges, leaving you with an unattractive, unnatural-looking end result.

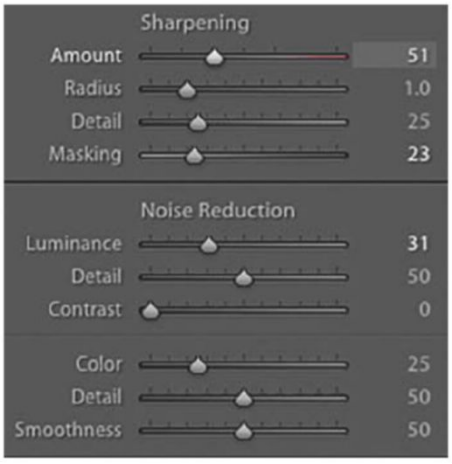
Sharpening raw images

RAW files particularly benefit from some kind of sharpening, as they are not processed files like JPEGs. Remember, JPEG files have already been sharpened by the camera at the point of capture, but raw files are like the digital equivalent of a negative.

Raw converters offer some powerful controls that allow you to apply sharpening to the image. Both Adobe Camera Raw and Lightroom offer a dedicated Detail tab, for instance, with sliders controlling the Amount, Radius, Detail and Masking. These tools do an identical job in Lightroom and Adobe Camera Raw.



Lightroom has numerous raw sharpening options



Use Lightroom's tools cautiously to avoid haloes

Amount As the name suggests, this slider controls the amount of sharpening – 0 being nothing, and 150 being maximum.
Radius The Radius slider controls the amount of blurring needed on the original to create the mask, affecting the edges you wish to enhance.
Detail This slider suppresses the halo effect when sharpening an image, allowing you to push the Amount further without the quality of the image deteriorating.
Masking The Masking slider helps you remove sharpening from areas of smooth tone, so it's useful when working with skin tones and clear blue skies. The higher the number, the greater the area of the image masked (depending on the original amount of detail in the shot).

The 'mix' you apply to your sharpening will vary from image to image. For instance, a good starting point for a landscape shot would be 40, 1, 35, 0, while a portrait might suit 35, 1.5, 15, 60.

You'll also need to zoom in 100% on your image to see any changes made, while you can hold the Alt key to preview the effect of the adjustment as you alter each slider for even greater control.

Don't forget that Lightroom enables you to sharpen selected areas of the image using the Adjustment Brush. You can also add further output sharpening (for print, for example) when you export an image.

© GEOFF HARRIS

Keep the Threshold low enough to sharpen key details and push Amount as needed, checking the effect in the Preview window

Unsharp Mask

IMAGES can also be sharpened in Photoshop and other image-editing programs, and while JPEG files have had image sharpening applied in-camera, some can still benefit from a certain amount of sharpening later.

We'd recommend you duplicate the layer first before you make changes, so any sharpening doesn't save over the original file. Instead, you have a sharpened layer that can be easily altered or removed. Sharpening should also be your final editing task before saving.

Unsharp Mask may sound like it has the opposite effect to sharpening, but like the Raw converter process, a blurred mask of the image is created to ascertain the edges in the image.

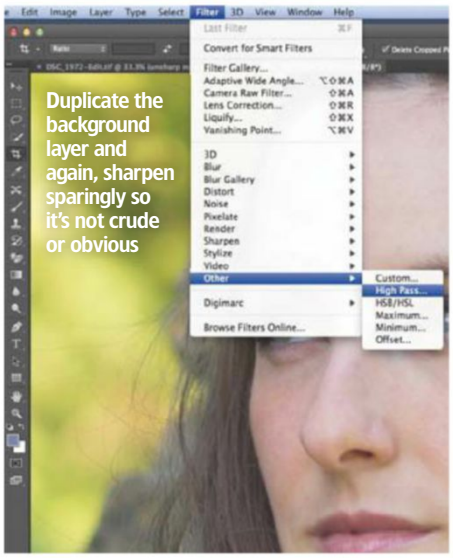
Found in the Sharpen category of Filters, Unsharp Mask offers similar controls to those found in Photoshop's Raw converter, but with the absence of Detail and Mask sliders. Instead, it has a Threshold control, which controls what is considered as an edge in the image. At higher values, only high-contrast edges are sharpened, with a good starting point of around 5-10 being the norm.

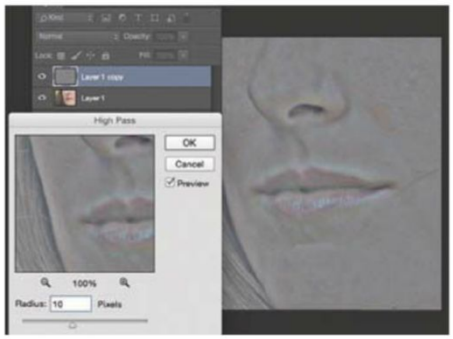
High Pass Filter

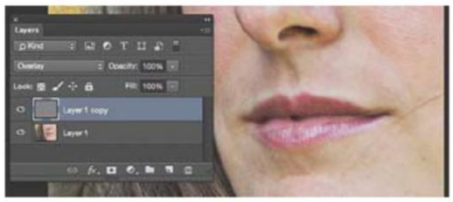
THE High Pass Filter technique is less well known than Unsharp Mask, but in many ways it's the better of the two sharpening methods. This is because the only areas that have sharpening applied are the edges, leaving skin tones and clear skies unaffected.

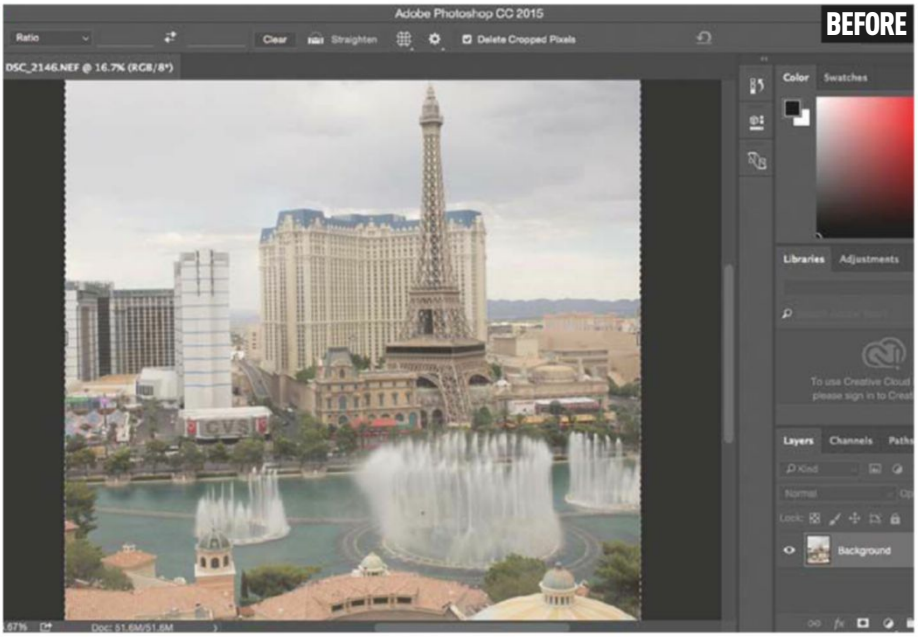
It's a simple process, but it requires a couple of steps to achieve. By starting with your Layers palette open, Duplicate the Background layer, and then change the blending mode of the new layer to Overlay.

With this done go to Filter, and from the drop-down list, select Other and then choose High Pass. Set the Radius to 10, and then hit OK. You can now fine-tune the sharpening with the Opacity slider for the duplicated background layer – zoom in to 100% on the image, and decrease the Opacity until you're happy with the result.









As well as mist, Dehaze is great for sharpening up shots taken through glass

Stop the shakes (and haze)

NEWER versions of Photoshop have some more handy tools for sharpening your shots. The Shake Reduction filter (found under Filter> Sharpen>Shake Reduction) automatically analyses the image and selects the area it thinks is suffering from camera shake. For finer control, you can add your own 'Blur Estimation' boxes to selections of the image, using the Smoothness and Artifact Suppression sliders to keep everything looking natural.

Dehaze, introduced in Creative Cloud 2015, is another useful slider when working with raw files. The Dehaze technology is based on a physical model of how light is transmitted, and it tries to estimate light that is lost owing to absorption and scattering through the atmosphere. It comes in particularly handy when shooting in misty mornings or in the golden hour. For the best results, set the white balance for the image before using Dehaze. Then, in the Effects panel, move the slider to the right in order to remove the haze from the original scene. Moving the slider to the left adds a creative haze effect for a moody, gauzy atmosphere. If you're pushing the slider to the extreme, it's good to refine the image using the Basic panel (increasing the shadow detail or refining the Vibrance slider) to keep the image natural. Dehaze also helps to reduce glare from windows and increase contrast in areas of middle grey in b&w images (see below).

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Shoot sharp like a pro

Guy Edwardes, our cover photographer, talks to **Geoff Harris** about how to make blur and camera shake a thing of the past

For professional photographers, soft shots aren't merely an annoyance – they can severely dent your reputation and earning power. Guy Edwardes is a leading nature and landscape photographer who took this issue's pin-sharp cover image of an osprey coming in for the kill. This is a notoriously tough technical challenge, as any bird photography enthusiast will testify. Guy has learned through trial and error how to keep images sharp. Here are his tips for banishing soft shots, both in terms of camera technique and gear.

Landscapes

1 As any experienced photographer will tell you, spend your money on the lens. High-quality lenses are particularly important, whether you are using telephotos or primes.

2 Don't rely too much on image stabilisation (IS). I would only use IS if it's really windy and there's a lot of vibration on the tripod.

3 Your tripod needs to be sturdy so it remains stable in high winds. Carbon fibre is good, as it's lighter than aluminium and offers suitable support.

4 Research the best tripod head for your needs. I use a Really Right Stuff BH-55 ballhead.

5 Get some aftermarket spikes for the tripod legs. They enable you to push through any grass or leaves, right into the soil, for greater security.

6 I make my tripods as secure as they can be, but if you do need extra stability use a bungee cord rather than a bag.

7 I nearly always use manual focus for landscapes as it makes it much easier to place the point of focus exactly where you need it to be. I then check for critical areas of sharpness by zooming in 100% in live view.

8 If I am trying to get as much depth of field as possible, I will use hyperfocal distance. Basically, I focus on the most distant part of the picture, then press the depth of field preview button so I can determine the shooting aperture. I then bring the focus slowly back towards me until that distant point starts to look soft. In the next step, I take it back again until I can judge the distant point to be acceptably sharp. This is how I know I have the maximum possible depth of field with that particular lens and aperture combination.

Guy has been a professional landscape, nature and travel photographer for over 20 years. Based in Dorset, he has a range of clients, and runs a number of courses and workshops. Guy is a committed Canon user; he favours the EOS 5D Mark III for landscape photography and the EOS-1D X for nature and wildlife images, and uses a range of Canon lenses. For more information, see **www.guyedwardes.com**.

9 If you are using a tripod rather than shooting handheld, you can get away with slower shutter speeds. However, only use a very narrow aperture if you really need maximum depth of field – you can actually end up with softer images through the process of diffraction.

10 I favour mid-range apertures, which will be f/8 or f/11, depending on the lens. I also keep the ISO down to 100 when shooting landscapes, in order to minimise noise.

Wildlife

11 For low-light shots or portraits, or whenever I am shooting with big telephoto lenses, I will use a tripod. However, I shoot handheld for fast-moving subjects and with smaller lenses. In these cases, it's important that I set a shutter speed that is as high as possible.

'Kranjska Gora, Slovenia'. For this shot, Guy used a high-quality wideangle zoom lens and a middle aperture of f/11 to achieve maximum quality. He manually focused using live view

ALL PICTURES © GUY EDWARDES

12 I use Canon's AI Servo (continuous AF) for moving subjects. I don't use back-button focusing as I end up having to press two buttons with action shots; I simply don't get on with it. If I want to hold the focus, I will use back-button focus lock.

13 I will use higher ISOs for wildlife when necessary in order to cope with low light and keep up the shutter speed. With the Canon EOS-1D X, I will go as high as ISO 12,800 if necessary – better a noisy, sharp shot than a soft, low noise one.

14 It's important to calibrate your lenses, particularly telephotos, as they are rarely set up perfectly out of the box.

15 I recommend a tool called LensAlign (michaeltapesdesign.com/lensalign.html). It's quite easy to use, and there are some useful tutorial videos on YouTube. AP

'Nutcrackers fighting, Bulgaria'. Guy used ISO 1,600 and shot handheld with a 600mm lens wide open at f/4 to achieve a fast shutter speed to freeze the action

Evening Class

Photoshop guru **Martin Evening** sorts out your photo-editing and post-processing problems

Adding a graduated sky

THIS picture from Kyle Bonallo highlights one of the biggest problems when shooting in JPEG mode. The photograph was taken using a Canon EOS 550D, which is capable of capturing a decent dynamic range providing you shoot in raw. The photograph was shot late in the evening, and the setting sun is just visible in the distance. However, because the exposure was set for the foreground, the sky detail is lost. I suppose one could add a separate sky image, but I didn't want to tamper much with the scene. The next best thing was to add a Graduated Filter adjustment that both darkened the sky slightly and added a warm tint. One of the key things here is the ability to brush-edit Graduated and Radial Filter adjustments. This allowed me to mask the effect from where it covered the slope on the right.

1 Basic panel adjustments

I opened the JPEG in Camera Raw and applied some basic panel adjustments. I lightened the Exposure by around 1/2 stop and increased contrast. At the same time, I darkened the Highlights and lightened the Shadows. Last, I fine-tuned the Whites and Blacks sliders.

2 Adjust the Tone Curve

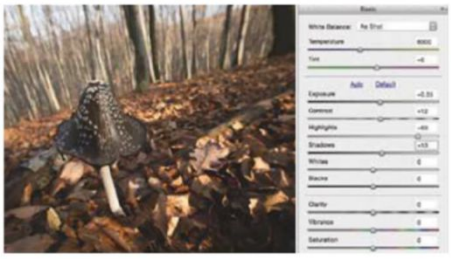
Next, I added a touch more Clarity to add more midtone contrast to the flowers in the foreground and increased the Vibrance to saturate the colours. I then went to the Tone Curve panel, where I adjusted the parametric sliders to add a further, finely controlled contrast boost.

3 Adjust Graduated Filter

Finally, I added a Graduated Filter adjustment, dragging down from the middle of the sky to just below the horizon. I set the Temperature slider to +68 to add a warm tint and, at the same time, set the Exposure to – 0.90 to darken the sky. Using the Brush edit mode I erased the effect from the slope on the right.

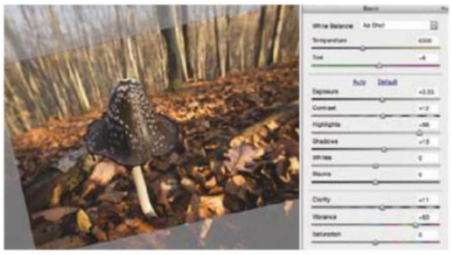
Spotlighting the subject

When taking photographs it is always worth exploring as many different angles as possible, because you never know which will work best. Here I show how I followed Paul Cooper's own treatment of his original to arrive at a rotated crop version where the fungus was selectively lightened to make it stand out. I like the extreme wideangle view. The fungus itself is beautifully sharp and the wide lens aperture gives the image a shallow depth of focus. Notice the softness of the distant trees, which have an almost painterly quality. This, along with the even texture of the blanket of leaves, helped make the fungus stand out.



1 Lighten the exposure

First, I went to the Basic panel, where I lightened the Exposure by just over 1/2 stop. I increased the Contrast slightly and then lightened both the Highlights and Shadows sliders. The photograph required further lightening, but I knew I could do this at the final stage using the Radial Filter.



2 Straighten the image

To apply a rotated crop to the photograph, I selected the Straighten tool and dragged along the base of the trees in the background. With the Crop tool selected, I then fine-tuned the crop to achieve the desired composition. At this stage, I also chose to boost the Clarity and Vibrance.

3 Radial Filter adjustment

Here, I selected the Radial Filter and added an Exposure lightening plus Clarity increasing adjustment to the fungus in the foreground. Then, I entered the Brush edit mode and erased around the edges of the fungus. Last, I added a Post Crop vignette to darken the corners slightly.

Brush editing filter adjustments

LATER versions of Camera Raw and Lightroom include the ability to brush edit a Radial or Graduated Filter adjustment. This means if you apply, say, a Graduated Filter adjustment, you can click on the Brush button to switch to the brush edit mode. You can then paint the mask that filters the adjustment to either reveal or hide the effect.

For example, in the image shown here (see left), a Graduated Filter adjustment was added to darken the sky. By selecting the Brush edit mode and painting in Erase mode, I was able to selectively remove the effect from the lighthouse. Having done that, I was able to continue editing the position and extent of the Graduated Filter. Therefore, the brush editing provides a secondary masking control for Graduated or Radial Filter adjustments.

Martin Evening is a noted expert in both photography and digital imaging. He is well known in London for his fashion and beauty work, for which he has won several awards. Martin has worked with the Adobe Photoshop and Adobe Lightroom engineering teams over many years and is one of the founding members of a software design company. Visit **www.martinevening.com**

Reader Portfolio

Spotlight on readers' excellent images and how they captured them

Snap from a Car

1 This shot was taken in London's Trafalgar Square and turns the tables on a common scene of snap-happy tourists in the capital
Canon EOS 5D Mark II, 70-200mm, 1/50sec at f/5.6, ISO 100

Next big thing

2 Brian has found a nice combination of elements here: the busker and the billboard text are perfect partners
Canon EOS 7D, 50mm, 1/100sec at f/8, ISO 100

Lovers

3 London's Southbank is one of Brian's favourite locations, and here he has captured a tender and candid moment
Canon EOS 5D Mark II, 24-105mm, 1/250sec at f/4, ISO 100

Brian Duffy, Hertfordshire

While Brian's photography is quite an eclectic mix, including landscapes and sports, we've focused on his street photography – a genre he identifies as one of his favourites. 'I quite enjoy watching the world go by and observing the weird and wonderful. I guess my street photography is an extension of this,' says Brian. He would like to make the switch to pro in the next three to five years, and has recently been contributing to his local newspaper.
www.brianduffy.co.uk

Shadows

4 Placing the subject off-centre suggests a sense of movement
Canon EOS 5D Mark II, 24-105mm, 1/2000sec at f/4, ISO 100

Tower Bridge

5 Brian's experiment with flash has resulted in this frozen moment
Canon PowerShot G16, 6.1-30.5mm, 1/60sec at f/2, ISO 320, flash

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Tripods, sticks & supports

Sharp pictures require a steady camera, but with tripods, monopods, clamps and beanbags to choose from, there's more than one way to keep everything on the level. Tracy Calder looks at some of the options

Suitable head
Whether you buy a ball-and-socket or a pan-and-tilt head for your tripod or monopod, make sure it's easy to use and flexible.

Maximum load
Make sure your chosen support can bear the combined weight of your heaviest camera and lens.

Folded length
If space is an issue, check the folded length of your support, or remove the filling from a beanbag and refill it at your destination.

Versatile feet
Tripods and monopods can slip on unstable ground; if you're likely to be shooting on sand, mud or gravel look for a model with spiked feet.

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3 Legged Thing Equinox Winston Carbon Fibre Tripod System

● £379 ● www.3leggedthing.com

MADE from eight layers of tightly woven carbon, the Equinox Winston tripod is as tough and sure-footed as its famous namesake. The legs are designed to carry payloads up to 30kg, which is enough for even the weightiest DSLR and lens combination. Despite its impressive strength, the Winston weighs just under 2kg (1.75kg to be precise) and has a folded length of 60cm, which is pretty good considering. It has three leg sections, each secured via the company's Paralock system – twist-locks made of aircraft-grade magnesium alloy.

Perhaps more impressive is the diameter of the thinnest leg section (generally the weakest tube on a tripod). Measuring a generous 2.3cm, it gives a good indication as to the strength of the overall product. In terms of height, the Equinox Winston can be extended to 185cm, and has a minimum height of 17cm. What's more, the legs can be set at 23°, 55° and 80°, which helps to speed things up. The company that makes it is British and prides itself on being quirky, so the Equinox Winston features bronze sections that give it a smartly regal finish.

Manfrotto PIXI EVO 2-Section Mini Tripod

● £45 ● www.manfrotto.co.uk

WITH a closed length of 23cm, and weighing 260g, the Manfrotto PIXI EVO 2-Section Tripod is just about pocketable. Unlike the simpler, cheaper PIXI model, which is intended for compacts and CSCs, the EVO is a tough little tool that can accommodate entry-level DSLRs and lenses up to 200mm. In fact, the combined weight it can bear is 2.5kg.

More than just a tabletop tripod, the PIXI EVO has 2-section legs that can be set to one of five steps, so holding everything steady on uneven terrain. The legs can also be positioned at two different angles (via a slide selector), giving the tripod a minimum height of 6cm – perfect for shooting at ground level.

The PIXI EVO features a ball head that enables the camera to be rotated 90°, facilitating shots in portrait format. This clever design detail makes the tripod a genuinely useful addition to the kit bag.

It's not been forgotten in the style stakes, either. The item is available in three colours: standard black, white and red-anthracite.

MeFOTO: RoadTrip Travel Tripod Kit

● £159 ● www.mefoto.com

ADDING colour to tripods seems to be all the rage and MeFOTO is among those companies leading the way. Thankfully, the design team behind the RoadTrip tripod range had more than just colour on its mind when it designed the Travel Tripod Kits.

Available in aluminium or carbon fibre, the tripods can be extended to 156cm, while the legs can be inverted and folded back to produce a collapsed package measuring 39cm. The legs can be set to two different angles, and the length is secured via a twist-lock system.

The tripod weighs 1.6kg and can support up to 7kg, enough to satisfy users of entry-level DSLRs, CSCs and bridge cameras. The legs are topped with a Q Series ball head, featuring separate ball and pan locks and an Arca Swiss type quick-release plate. The head also has a spirit level.

Last but not least, the tripod can also be converted into a monopod by removing one of the legs and combining it with the centre column.

ALL PRICES ARE APPROXIMATE STREET PRICES

Giottos: Memoire 100 Professional Trekking Pole and Selfie Stick

● $120 (£81 plus shipping) ● www.giottos.com

OUTDOOR enthusiasts can now kill two birds with one stone (not literally) with the Giottos Memoire 100 Professional Trekking Pole and Selfie Stick. The shaft of this pole is made of aerospace aluminium alloy, which means it's incredibly light (350g) yet super strong (it'll take loads up to 60kg). The pole has four sections and measures 150cm extended and 62cm retracted. The length can be adjusted via a flick-lock system (with built-in suspension).

The Memoire 100 is more than just a weight-bearing stick; it also has a compass, Bluetooth 3.0 remote shutter (and space for batteries), a tungsten alloy tip and three types of rubber ends for different types of surfaces.

Its wow factor, though, lies in the pole's ability to transform into a basic tripod or selfie stick. Using a retractable cell phone clamp, screens up to 6in can be attached and angled.

Meanwhile, the other end of the Memoire 100 can be fitted with tripod legs, making it a truly versatile product.

Wildlife Watching Supplies C14.3 Standard Double Beanbag (inc. liners)

- £30 (unfilled)
- www.wildlifewatchingsupplies.co.uk

WHEN you're shooting at ground level and don't have the time, or perhaps the ability, to reverse the centre column on your tripod, a beanbag can be indispensable. These cushions are perfect for supporting cameras and spotting scopes, and can even dampen the vibration caused by the internal workings of your device. The C14.3 Standard Double Beanbag is a particularly fine example with two main compartments that can be filled with beans, rice, corn, bird food or, for an ultra-light option, polyester. It's designed to support lenses up to 600mm and has been made to last, being constructed using extra-strong thread and double stitching.

Manfrotto 055 kit (055XPRO3 3-section aluminium tripod and XPRO ball head)

- £300
- www.manfrotto.co.uk

THE 055 tripod series is celebrated for its adaptability but anyone looking to save a few pounds would do well to consider the 055XPRO3 kit.

The main selling point is the centre column which can be extended vertically or horizontally, without the need to disassemble the tripod. You simply loosen a wing nut, extend the column, press a button at the bottom and rotate it 90°.

The tripod can take loads up to 8kg, extend to 183cm and has a closed length of 74cm. It can get as close to the ground as 9cm. The XPRO3 ball head has a triple-locking system to ensure your camera stays put, too.

MeFOTO SideKick360 Smartphone Adapter

- £34
- www.mefoto.com

A CAMERA phone is no longer a poor substitute for a compact. These smart devices can shoot 16MP files, and employ a raft of automatic and semi-auto features, so it makes sense to support these capable computers with hi-spec accessories, such as the MeFOTO SideKick360 Smartphone Adapter.

The SideKick360 can be mounted on almost any tripod with an Arca Swiss-style quick-release clamp (as well as many monopods), and the phone is held in place via a dual-clamp system. A 360° rotating ball joint allows your phone to be positioned horizontally, vertically or anywhere in between.

The SideKick360 can also stand alone on a flat surface for tabletop shooting. There are a variety of sizes available and a range of colours. The device can support 500g and weighs a modest 900g.

Manfrotto 190 Go! Aluminium 4 Section Tripod

- £160
- www.manfrotto.co.uk

MANFROTTO'S 190 range boasts many lightweight yet surprisingly compact tripods, but the 190 Go! Aluminium 4 Section Tripod is one of the finest. This capable support weighs 1.7kg and has a folded length of 45cm, making it the lightest in the aluminium range by some margin. It has twist-lock legs that can support a payload up to 7kg but the extended height of 146cm is disappointing.

The legs of the 190 Go! can lock at four different angles and, once teamed with the 90° tilting centre column, enable you to get as low as 9cm. Changing the column from vertical to horizontal is easy. An Easy Link socket on the spider enables you to attach accessories. The 3/8in top screw is compatible with most tripod heads.

Gitzo GT1555T Traveler 5 Section Tripod

- £640
- www.gitzo.co.uk

GITZO Traveler tripods are lightweight, tall and strong, but they are also expensive. The GT1555T is the headless version of the Traveler Tripod Kit GK1555T-82TQD, and has plenty of features. Its legs are made of Carbon eXact tubes, which Gitzo claims makes them especially stiff and rigid. The tubes also have large diameters, which helps to improve stability. The Traveler range uses twist-lock rings (what Gitzo calls the G-lock system) that allow the GT1555T to pack down to 35.5cm and weigh 1.03kg.

The 180° leg folding system enables the centre column to fit between the folded legs, saving space. Fully extended, the tripod is 138cm. It can take loads up to 10kg. The top attachment has 3/8in and 1/4in screw thread options.

Benro TMA28A Mach3 Aluminium Tripod

- £119
- www.benroeu.com

ANYONE keeping an eye on their cash will be delighted to learn that you can still buy a reliable tripod for just under £120. The TMA28A Mach3 has a maximum load of 14kg, extends to 155.5cm and folds down to 52.5cm. As you'd expect for the money, this tripod is made of aluminium (with durable magnesium castings), and is not the lightest on the market at 1.76kg without a head.

The legs use a twist-lock system that allows them to be released easily. One leg of the TMA28A Mach3 can be converted into a monopod. The leg angle locks have three different settings, one of which is notably wide, and the tripod comes with an additional short centre column for low shooting. The TMA28A Mach3 has a minimum height of 31.5cm, making it a good all-rounder at a keen price.

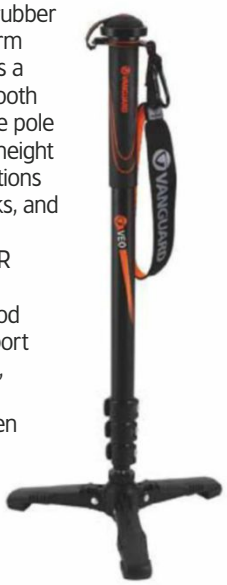
ALL PRICES ARE APPROXIMATE STREET PRICES

Vanguard VEO AM-264TR Aluminium Monopod

- £80
- www.vanguardworld.co.uk

A MONOPOD, typically, means one leg, and one leg, typically, means limited stability. The VEO AM-264TR Aluminium Monopod, however, is an exception to this rule. This versatile pole has three retractable legs (forming a tri-form platform) at the bottom, finished with anti-slip rubber feet. Where the platform meets the pole there is a ball joint to enable smooth panning and tilting. The pole can be extended to a height of 163cm via four sections and a series of flip locks, and reduced to 56.5cm.

The VEO AM-264TR deserves serious consideration as a tripod alternative. It can support 6kg and weighs 900g, acceptable when you consider its height when extended, and it has a diameter of 26mm, which is good for strength and stability.



Calumet CK8106 Series 5 Section 8x Carbon Monopod

- £125
- www.calphoto.co.uk

DESPITE being made of eight layers of carbon fibre, the CK8106 5 Section Monopod from Calumet weighs a mere 450g, making it a great support for long excursions. Fortunately, light weight doesn't mean low strength since this monopod can support camera and lens combinations up to 6.4kg.

The pole's most impressive feature, however, is its fully extended length of 187cm. It's a great monopod for shooting over crowds. When fully retracted, the pole measures 52cm. The length is secured via four chunky twist-locks.

Another plus point is the spring-loaded platform thread on the top. It features both 3/8in and 1/4in screw-thread options, and magnesium-alloy tooling. The monopod comes with a soft fabric wrist strap and has a rubber foot.

Takeway T1 Clampod

- £49
- www.takeway.tw

THE T1 can support any camera, camcorder, iPad and smartphone or, indeed, any electronic device that weighs less than 3kg, despite weighing less than 200g itself. Rather handily, it can also be used as a flashgun or microphone stand.

The top section of the T1 consists of a ball head and quick-release plate but if its 3kg rating isn't enough for you, the head can be substituted for a heavier duty one. The bottom section features a wonderfully engineered, if slightly odd-looking, clamp, which allows the T1 to grip on to almost anything: tree branches, shelves, fence posts, you name it. It can also stand alone, which is great for time-lapse photography. Regardless of the position you put the clamp in, it is strong and stable.

Vanguard VEO 204AB Aluminium Travel Tripod

- £99
- www.vanguardworld.co.uk

THE VEO 204AB prides itself on being super lightweight and super compact, and the specifications bear this out. The centre column can be inverted so it fits between the folded legs, giving the tripod a collapsed length of 39.5cm (with a fully extended height of 135cm). The combined weight of this leg and head kit is 1.27kg, which, considering it's made of aluminium, is remarkable. It can hold just 4kg, however.

The legs comprise four sections, secured via lever locks, and can be set to one of three angles. To assist with low-angle shots, the VEO 204AB is also supplied with a special adapter. The basic kit includes a smooth ball head, which makes panning and tilting the camera a breeze. A rubber grip on one leg puts an end to icy fingers when you're out and about.

Giottos Memoire 2-way Cell Phone Clamp with Mini Tripod

- £40
- www.giottos.com

THE MEMOIRE 2-way Cell Phone Clamp is a robust aluminium stand that can withstand the odd bump and scratch. It can hold up to 30kg and weighs a pocketable 125g (without the mobile phone clip). The 1/4in screw thread enables it to support most DSLRs, while the three-point phone clamp will accept most phones 3.5-6in in diameter.

A spring-axle movement at the base of the clamp allows the holder to be rotated 45° to enable the phone to be positioned vertically or horizontally. The clamp also has a clutched gear that permits a certain amount of fine-tuning. Rubber feet, an anti-skid pad on the mounting plate, and leg-joint traction hold everything nice and steady.

Gitzo GT2532 Mountaineer Series 2 Carbon Fibre 3 Section Tripod

- £660
- www.gitzo.co.uk

GITZO has been making carbon-fibre tripods for more than two decades, and the first to roll off the production line was the Mountaineer. Despite being refined and refreshed over the years, this popular range has remained true to its roots. The Mountaineer Series 2 Carbon Fibre tripod offers exceptional rigidity in a package weighing 1.67kg, and measuring 65cm when folded. The legs can be raised in three sections, and feature screw-type twist locks (a locking system Gitzo calls G-lock Ultra) designed to stop dust from entering the system.

The legs can be set to one of three different angles, the widest being 23°, which allows you to position a camera as low as 16cm from the ground.

Meanwhile, the GT2532 can reach 166cm when fully extended, which should be enough for most photographic jobs.

Equivalent apertures

Generations of photographers have been taught to use f/8 for sharpest results. **Andy Westlake** investigates whether this is still a good rule

I'm pretty sure most photographers will have heard the phrase 'f/8 and be there'. It's long been considered a handy rule of thumb for getting the sharpest results from your lenses. Shoot at wider apertures and you risk getting softer images, due to blurring from lens aberrations and, perhaps, inadequate depth of field. Stop down further and your images will get progressively softer due to diffraction, and perhaps also suffer from camera shake if you try to handhold at too-slow shutter speeds. In general, when shooting 35mm film, f/8 often represents a happy medium between these various effects.

Equally, keen students of photography will likely be aware of the 'Group f/64' of photographers active in California in the 1930s, of whom Ansel Adams is perhaps the best-known member. As their name implies, they expounded stopping their lenses down to f/64 to get the sharpest, most detailed results. How can we reconcile these two apparently contradictory principles?

The answer lies in film formats. Adams and his associates were using large-format cameras that produced negatives of up to 10x8in. It turns out that due to the laws of optics, the larger the film format, the smaller the aperture required to achieve any given depth of field. But the flip side is that diffraction blurring has a weaker impact on image sharpness on larger formats, too. So while large-format photographers need to use small apertures like f/64 to gain sufficient front-to-back sharpness, they can get away with it without excessive blurring of their images, too.

In fact, when you do the calculations, the two effects go precisely hand in hand. If you double the dimensions of the film or image sensor, you have to double the f-number to get the same depth of field. At this point you'll also get exactly the same degree of diffraction blurring, when looking at the image as a whole.

Of course, this is all very well, but you may be wondering what relevance it has today. Well, with the proliferation of different sensor

This image shows how the size of the entrance pupil relates to the focal length and aperture. A 50mm lens set to f/2 (far left) has the same size entrance pupil as a 100mm set to f/4 (left)

Digital cameras use a wide range of sensor sizes, with the full-frame sensor in the Nikon D810 (far left) being four times the area of the Four Thirds sensor in the Olympus OM-D E-M5 II (below) and APS-C halfway in between

As these two pictures illustrate, shooting at f/2 on a camera with a Four Thirds sensor gives broadly the same results as f/4 in full frame, in terms of both depth of field and the blurring of out-of-focus areas

sizes in digital cameras, it is more important than ever, as each has a different optimum aperture setting.

Sensor size and aperture selection

If you use cameras with different size sensors – perhaps a 1-inch sensor compact, a Micro Four Thirds mirrorless model and a full-frame DSLR – it's important to understand how best to set the aperture on each. For this, I'm going to introduce an important concept of equivalent apertures. This is directly analogous to the familiar idea of equivalent focal lengths, which helps us to visualise the relationship between focal length, sensor size and angle of view. In a similar fashion, the idea of equivalent apertures helps us understand how to get the same depth of field and diffraction blurring on different sensor formats.

The basic principle here is that for any given angle of view, the depth of field and diffraction blurring is determined mostly by the size of the lens's entrance pupil – i.e. the diameter of the aperture as seen from the front of the lens. This is what the f-number refers to. With a 200mm lens at f/8, for example, the entrance pupil is 200mm divided by 8, or 25mm.

Let's imagine that we want to replicate the pictorial effect of using a 200mm lens at f/8 on a full-frame camera, but with a camera that has a different sized sensor. For the sake of simplicity I'm going to use Micro Four Thirds as an example, because the 'focal length multiplier' or 'crop factor' is 2x, which makes the maths very easy. To get the same angle of view, we need to use a 100mm lens, and to get a 25mm entrance pupil, we need to set an aperture of 100mm divided by 25mm, which equals f/4. So, just as a 100mm lens on micro four thirds is equivalent to 200mm on full frame in terms of angle of view, f/4 on micro four thirds is equivalent to f/8 on full frame in terms of depth of field and diffraction blurring. From this it follows that, ideally, we should be setting the aperture to f/4, or thereabouts, on micro four thirds, most of the time.

Now at this point you might be wondering about those optical aberrations we were worried about earlier. Fortunately, it turns out that lenses designed to cover a smaller sensor size can usually be made with fewer aberrations at any given aperture.

It should be easy to see from this example that just as equivalent focal lengths are related by the sensors' crop factors, so are equivalent apertures. It's therefore simple to establish a set of apertures equivalent to f/8 on full frame for the most commonly used sensor sizes. For APS-C (1.5x crop) it's f/5.6; for micro four thirds (2x crop) it's f/4; and for 1in (2.7x crop) it's f/3. Equally, if we consider f/16 to be the smallest aperture we're happy to use on full frame before diffraction blurring becomes completely intolerable, we should limit ourselves to f/11 on APS-C, f/8 on Micro Four Thirds and f/6.3 on 1-inch sensor cameras.

Modern lenses are sharper

Another point is that modern lenses are better than those from 10 or 20 years ago. They're much sharper and so can be used at larger apertures, while still giving sharp pictures. The shallow depth of field at larger apertures can still be a problem but the latest autofocus systems are more capable, while electronic live view permits accurate manual focusing.

Summary

If you buy a camera with a 1-inch or Four Thirds sensor, you're best off using larger apertures than you might be used to with full frame, at least in terms of sharpness. Apply this principle and you'll be well on the way to getting the best from your cameras. AP

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Sigma's 50mm f/1.4 DG HSM Art and the Zeiss Otus 55mm f/1.4: two of the sharpest lenses currently available

REVEALED

The sharpest lenses

We consult **DxOMark's** comprehensive optical test data to find the sharpest lenses for each camera system. **Andy Westlake** is your guide

A question often posed by photographers is: 'What's the sharpest lens I can buy for my camera?' In reality this can only properly be answered by examining lens tests that have been carried out in a reliable and repeatable way. It's also a question that needs to be qualified. Do you want a wideangle or a telephoto, a zoom or a prime? What's your budget? With all this in mind, we decided to provide some kind of sensible answer anyway.

Although we've tested more lenses than ever over the past couple of years, we've had to accept that even that's not enough to provide a useful answer. For this reason, we've teamed up with DxOMark, one of the most respected names in the photographic industry, to sift through its extensive database of lens-test data in order to pick out the sharpest optics for each major camera system.

About DxOMark

DxOMark is part of the Paris-based company DxO Labs. Its lens and camera tests employ the same home-grown DxO Analyser software that is used to determine the aberration corrections that are an integral part of the firm's award-winning OpticsPro raw-conversion software. We've analysed DxOMark's sharpness scores for each major camera system to see which lenses come out on top. The lists of the sharpest lenses for each camera system in this article have also been filtered for some degree of affordability, leaving out any lens priced above £2,000. In addition, we've only included lenses that are available for sale as new.

It's worth bearing in mind that even DxOMark's database isn't 100% comprehensive, and not all lenses have been tested on all cameras, including several recent third-party optics. However, it follows that if any given lens produces good results on, for example, Canon full-frame models, it should give equally good results on Nikon, Pentax or Sony full-frame cameras. All the data used for this article can be analysed in more detail on the DxOMark website at www.dxomark.com.

A note on modern lens testing

At one time, lens testing used to be carried out using specialist (and expensive) optical benches. However, it's now much more practical to use a suitable camera body for testing. Thousands of test exposures can be made at essentially no cost, and the raw files analysed to measure sharpness

However, one complication of this approach is that it tests the system as a whole – in other words, the lens and the camera combined. This can still give extremely useful results, but it does have its caveats. In particular, the measurements are influenced by the camera's sensor, in particular its resolution and optical low-pass filter (OLPF). Higher resolution sensors tend to give higher sharpness measurements, while sensors with no OLPF give higher readings than those without.

Because of this, when looking to compare lenses for sharpness, they really need to have been tested on the same camera body. When comparing across systems, only use tests conducted with similar resolution cameras.

Canon

Full frame (tested on EOS 5DS R)

IT SHOULD come as no great surprise to learn that the sharpest lens DxOMark has tested on the EOS 5DS R is a premium telephoto prime, the Canon EF 300mm f/2.8L IS II USM. The catch is its £4,799 price tag, meaning that it's mostly limited to use by professional photojournalists. Also on the rarefied list of premium ultra-sharp optics are Canon's 600mm f/4 and 400mm f/2.8 telephotos, and Zeiss's ultra-premium Otus 55mm f/1.4 and 85mm f/1.4 – none of which counts as affordable.

SUPER SHARP
Canon 35mm f/1.4 II USM
Tested on the Canon EOS 5DS R

BEST ZOOM
Tamron SP 70-200mm f/2.8
Tested on the Canon EOS 5DS R

Our list of the sharpest lenses under £2,000 is headed by the manual-focus Zeiss 135mm f/2, while Canon's own top-ranking optic is the stellar, but pricey, EF 35mm f/1.4L II USM. However, enthusiast photographers will perhaps be more interested by the presence of Sigma's f/1.4 Art-series primes, which currently sell around the £600 mark. The 50mm scores especially highly, but the 35mm, 20mm and 24mm also perform very well.

Canon's relatively inexpensive 35mm f/2 IS USM and 24mm f/2.8 IS USM make an appearance. It's worth noting that some additional stars in terms of value are the sub-£100 EF 50mm f/1.8 STM and the £149 EF 40mm f/2.8 STM, even if they don't quite make the top-ten list. Turning our attention to zooms, the Tamron SP 70-200mm f/2.8 Di VC USD edges ahead of Canon's EF 70-200mm f/2.8L IS II USM. However, standard and wideangle zooms aren't well represented, with Sigma's impressive 24-35mm f/2 DG HSM Art being the strongest.

Top lenses under £2,000

1. Zeiss Apo Sonnar T* 135mm f/2 ZE
2. Sigma 50mm f/1.4 DG HSM Art
3. Canon EF 35mm f/1.4L II USM
4. Tamron SP 70-200mm f/2.8 Di VC USD
5. Canon EF 35mm f/2 IS USM
6. Sigma 35mm f/1.4 DG HSM Art
7. Sigma 20mm f/1.4 DG HSM Art
8. Canon EF 70-200mm f/2.8L IS II USM
9. Sigma 85mm f/1.4 EX DG HSM
10. Canon EF 24mm f/2.8 IS USM

APS-C (tested on EOS 7D Mark II)

ALL THE full-frame lenses listed left also give excellent results on APS-C, but how about lenses dedicated to the smaller format? Here Sigma tops the list with its impressive 18-35mm f/1.8. Its sadly discontinued 50-150mm f/2.8 zooms also scores highly. Samyang's 16mm f/2 wideangle prime and Canon's inexpensive compact EF-S 24mm f/2.8 STM are the sharpest primes.

TOP VALUE
Canon EF-S 24mm f/2.8 STM
Tested on the Canon EOS 7D Mark II

Top lenses under £2,000

1. Sigma 18-35mm f/1.8 DC HSM Art
2. Samyang 16mm f/2 ED AS UMC CS
3. Canon EF-S 24mm f/2.8 STM
4. Tamron SP 17-50mm f/2.8 Di II XR VC LD
5. Sigma 30mm f/1.4 DC HSM Art
6. Canon EF-S 60mm f/2.8 Macro
7. Canon EF-S 17-55mm f/2.8 IS USM

Nikon

Full frame (tested on Nikon D810)

BEST WIDE
Nikon 24mm f/1.8G ED
Tested on the Nikon D810

MUCH the same as with Canon, the full list of the sharpest lenses for Nikon's full-frame DSLRs is dominated by expensive primes. It's headed by Zeiss's £1,600 135mm f/2 optic, with the highest-placed Nikkor being the AF-S 200mm f/2G ED VR that costs £4,100. Nikon's 300mm f/2.8 and 400mm f/2.8 professional telephotos are also up there, along with the Zeiss Otus 55mm f/1.4 and 85mm f/1.4 primes. All these cost £2,700 or more, so are unlikely to find their way into many amateurs' kit bags.

But how about lenses you might actually be able to afford? Again, Sigma's Art-series primes are strongly represented, with the 50mm f/1.4, 35mm f/1.4 and 24mm f/1.4 all in the top ten. Tamron's recent SP 35mm f/1.8 Di VC USD also makes the list alongside some nice Nikkor primes, in the shape of the 85mm f/1.4 and the relatively affordable 24mm f/1.8. Two more Zeiss manual-focus primes – the Milvus 50mm f/1.4 and the Distagon 25mm f/2 – complete a wide, normal and telephoto trio alongside that top-ranked 135mm f/2.

The highest-placed zoom is Nikon's highly regarded AF-S 70-200mm f/4G ED VR, but in practice the Nikon and Tamron 70-200mm f/2.8 lenses are only slightly lower placed. The sharpest non-telephoto zoom tested by DxOMark is the Sigma 24-35mm f/2 DG HSM Art, while the Tamron SP 15-30mm f/2.8 Di VC USD provides strong competition for the legendary Nikon AF-S Nikkor 14-24mm f/2.8G ED in the wideangle arena.

Top lenses under £2,000

1. Zeiss Apo Sonnar T* 135mm f/2 ZF
2. Sigma 50mm f/1.4 DG HSM Art
3. Zeiss Milvus 50mm f/1.4 ZF.2
4. Sigma 35mm f/1.4 DG HSM Art
5. AF-S Nikkor 24mm f/1.8G ED
6. AF-S Nikkor 85mm f/1.4G
7. Zeiss Distagon 25mm f/2 ZF.2
8. AF-S Nikkor 70-200mm f/4G ED VR
9. Tamron SP 35mm f/1.8 Di VC USD
10. Sigma 24mm f/1.4 DG HSM Art

DX (Tested on Nikon D7100)

LOOKING at lenses specifically designed for the smaller DX sensor, we see Sigma taking three of the four top spots. Its stunning 18-35mm f/1.8 ultra-fast zoom deservedly comes out on top, with the 30mm f/1.4 fast normal prime a close second, and the versatile 17-50mm f2.8 optically stabilised zoom also acquitting itself highly.

Tamron also gets in on the game with its somewhat underrated 60mm f/2 Macro, which can double up nicely as a portrait lens, and its own 17-50mm f/2.8 image-stabilised zoom, which is a close match to the Sigma.

FAST ZOOM
Sigma 18-35mm f/1.8 Art
Tested on the Nikon D7100

Nikon's own sharpest DX lens, according to DxOMark's tests, is the quite inexpensive Micro-Nikkor 40mm f/2.8G, which costs just £200. With 1:1 magnification it's a good option for DSLR users on a budget. Meanwhile, the DX 35mm f/1.8G fast normal prime is even more affordable at around £150. Another great budget option for Nikon DX users is the AF-S 50mm f/1.8G, which makes for a nice short telephoto 'portrait lens', and of course also works on full-frame cameras.

Top lenses under £2,000

1. Sigma 18-35mm f/1.8 EX DC HSM Art
2. Sigma 30mm f/1.4 EX DC HSM Art
3. Nikon AF-S DX Micro-Nikkor 40mm f/2.8G
4. Sigma 17-50mm f/2.8 EX DC OS HSM
5. Tamron SP AF 60mm f/2 Di II LD IF Macro
6. Tamron AF 17-50mm f/2.8 Di II XR VC LD
7. Nikon AF-S DX Nikkor 35mm f/1.8G

Pentax

Full frame

GREAT MACRO
Pentax 35mm f/2.8 Macro
Tested on the Pentax K-3

DXOMARK hasn't, at the time of writing, published lens test results using the full-frame Pentax K-1. However, it's clear that the Pentax 15-30mm f/2.8 and 24-70mm f/2.8 zooms are strongly related to Tamron designs that test very well on other full-frame cameras, so the omens are very good for these. As for how its other lenses behave on full frame, we'll just have to wait and see. In the meantime, we've included all the Pentax-compatible lenses DxOMark has tested, both full frame and APS-C, in the list to the right.

APS-C (tested on Pentax K-3)

Pentax has easily the most comprehensive lens range tailored specifically for APS-C DSLRs, but it also has the least support from third-party makers, with neither Tamron nor Tokina manufacturing K-mount versions of its lenses. The list of sharpest lenses reflects this, with plenty of Pentax's compact DA-series primes included. Users on a budget will be pleased to see both the DA 50mm f/1.8 and the DA 35mm f/2.4, both of which can be found for under £100.

However, a couple of Sigma optics sit proudly at the top of the pile, in the shape of the 35mm f/1.4 and the 17-50mm f/2.8. Some full-frame-compatible D FA lenses also appear, such as the 50mm f/2.8 Macro, as do a couple of Samyang's high-quality full-frame, manual-focus primes. Both of its 24mm f/1.4 and 85mm f/1.4 primes cover full frame, and offer impressive image quality for their sub-£300 price tags.

Top lenses under £2,000

1. Sigma 35mm f/1.4 DG HSM Art
2. Sigma 17-50mm f/2.8 EX DC HSM
3. Pentax HD DA 35mm f/2.8 Macro Limited
4. Samyang 85mm f/1.4 Asph IF
5. Pentax SMC DA 50mm f/1.8
6. Pentax SMC D FA 50mm f/2.8 Macro
7. Pentax SMC FA 50mm f/1.4

Fujifilm

DXOMARK hasn't tested any of Fujifilm's X-system lenses to date. The reason for this is essentially pragmatic; the DxO Analyser test software doesn't understand the unique X-Trans colour filter array that Fujifilm uses in the majority of its cameras.

Fujifilm's lens range is extensive and unusually coherent; indeed it's probably the best thought-through of all APS-C systems. The lenses are of generally very high optical quality, too. Third-party support includes a few manual-focus Samyang optics, including the 50mm f/1.2 and 32mm f/1.4 that we tested earlier this year and liked very much, and Zeiss's premium Touit line. Of these, the 12mm f/2 wideangle and 50mm f/2 1:1 macro have no direct equivalent from Fujifilm itself.

Fujifilm's XF lens range is generally excellent; this 90mm f/2 is particularly sharp

Sony Alpha

Full frame
(tested on Sony Alpha 99)

PORTRAIT MAGIC
Sony 85mm f/1.4
Tested on the Sony Alpha 99

SONY'S attention may have switched more towards its E-mount Alpha 7 series over the past couple of years, but the A-mount system it originally inherited from Minolta is still very much supported, with a decent native lens range and plenty of third-party options, too. So users of Sony's DSLRs and more recent electronic viewfinder DSLT cameras still have plenty of good lenses to choose from.

A couple of Sigma optics top the list of sharpest lenses according to DxOMark's tests, where it's no surprise to see the latest incarnation of the excellent 105mm f/2.8 Macro alongside the 35mm f/1.4 Art. Sony's own lenses are well represented, too, headed by the stellar Zeiss Planar 85mm f/1.4. Three 24-70mm f/2.8 lenses are included from Sony, Sigma and Tamron, in that order, although in reality there's little to separate them in terms of sharpness.

Some older lenses appear on this list as well: the 50mm f/1.4, 50mm f/2.8 Macro and 100mm f/2.8 Macro are all based on Minolta designs. This may seem surprising, but to a great extent it reflects the fact that while older lenses tend to be less sharp wide open, the difference is less marked when they're stopped down to their sharpest apertures.

Top lenses under £2,000

1. Sigma 35mm f/1.4 DG HSM Art
2. Sigma 105mm f/2.8 EX DG OS Macro HSM
3. Sony Zeiss Planar 85mm f/1.4 ZA
4. Sony 50mm f/1.4
5. Samyang 24mm f/1.4 ED AS UMC
6. Sony Vario-Sonnar T* 24-70mm f/2.8 ZA SSM II
7. Sigma 24-70mm f/2.8 EX DG HSM
8. Sony 100mm /2.8 Macro
9. Tamron SP 24-70mm f/2.8 Di USD
10. Sony 50mm f/2.8 Macro

MANUAL MARVEL
Samyang 24mm f/1.4
Tested on the Sony Alpha 99

APS-C (tested on Sony Alpha 77)

LOOKING at Alpha-mount lenses designed specifically for APS-C cameras, Sony's budget range of SAM primes perform really rather well. The 35mm f/1.8, 50mm f/1.8 and 30mm f/2.8 Macro all represent remarkable value at under £150 each. Two highly regarded standard zooms, the 16-80mm f/3.5-4.5 and 16-50mm f/2.8, essentially tie with each other in terms of sharpness.

Leading third-party options again include the Tamron 60mm f/2 Macro, with Samyang's manual-focus 16mm f/2 wideangle prime also making an appearance. This reiterates the generally fine optical performance of this Korean lens maker's designs, while the lack of autofocus is perhaps least problematic with a wideangle lens.

FAST & SHARP
Sony DT 50mm f/1.8 SAM
Tested on the Sony Alpha 77

Top lenses under £2,000

1. Sony DT 50mm f/1.8 SAM
2. Sony DT 35mm f/1.8 SAM
3. Tamron SP AF 60mm f/2 Di II LD IF Macro
4. Sony DT 30mm f/2.8 Macro SAM
5. Samyang 16mm f/2 ED AS UMC CS
6. Sony Vario Sonnar T* DT 16-80mm f/3.5-4.5 ZA
7. Sony DT 16-50mm f/2.8 SSM

Sony E-mount

Full frame
(tested on Sony Alpha 7R)

SONY'S FE range for its full-frame Alpha 7 mirrorless cameras is less than three years old, but it's starting to fill out nicely. Meanwhile, Zeiss's autofocus Batis and manual-focus Loxia ranges both feature premium optics. As a result, there are some exceptionally sharp lenses available, benefiting from all the latest advances in optical design.

Top of the list is the exceptional Sony 90mm f/2.8 Macro, which is one of the very sharpest lenses we've ever tested. The 55mm f/1.8 that follows it is barely less impressive. The quality of Zeiss's contribution is confirmed by the presence of its Batis 85mm f/1.8 telephoto and Loxia 21mm f/2.8 wideangle. Perhaps most interesting is how the relatively lowly £379 Sony FE 28mm f/2 slots into fifth place, marginally ahead of the Sony FE 35mm f/1.4. And while the premium 24-70mm f/2.8 G Master optic only comes in tenth, this simply reflects the excellence of the other lenses.

Top lenses under £2,000

1. Sony FE 90mm f/2.8 Macro G OSS
2. Sony FE Zeiss Sonnar T* 55mm f/1.8 ZA
3. Zeiss Batis 85mm f/1.8
4. Zeiss Loxia 21mm f/2.8
5. Sony FE 28mm f/2
6. Sony FE Zeiss Distagon T* 35mm f/1.4 ZA
7. Sony FE 70-200mm f/4 G OSS
8. Zeiss Batis 25mm f/2
9. Sony FE Carl Zeiss Sonnar T* 35mm f/2.8 ZA
10. Sony FE 24-70mm f/2.8 GM

PIN SHARP
Sony 90mm f/2.8 Macro
Tested on the Sony Alpha 7R

APS-C (tested on Sony Alpha 6000)

SONY'S APS-C E-mount lens range may not be the largest but it covers all the main bases and includes a good selection of high-quality small primes. With a smattering of third-party options also available from Sigma and Zeiss, enthusiast photographers will find that there's plenty to choose from without breaking the bank. Indeed, the sharpest lens on DxOMark's list, the Sigma 60mm f/2.8 DN A, costs a mere £120. Even the fast Sigma 30mm f/1.4 DC DN C can be bought for less than £250.

Among Sony's own optics it's no great surprise to see the premium Zeiss-branded 24mm f/1.8 topping the list, but at £679 it's difficult not to feel it should do even better. The two lenses below it offer the distinction of being the fastest image-stabilised lenses in the system, and both the 35mm f/1.8 OSS and 50mm f/1.8 OSS are quite affordable, too, at around £320 and £200 respectively. The top-placed zoom here is the somewhat video-focused 18-105mm f/4 powerzoom, although its range makes it an interesting option for stills photographers, too.

Top lenses under £2,000

1. Sigma 60mm f/2.8 DN Art
2. Sigma 30mm f/1.4 DC DN Contemporary
3. Sony Zeiss Sonnar T* E 24mm f/1.8 ZA
4. Zeiss Touit 32mm f/1.8
5. Sony E 50mm f/1.8 OSS
6. Sony E 35mm f/1.8 OSS
7. Sigma 19mm f/2.8 EX DN
8. Sony E PZ 18-105mm f/4G OSS
9. Sigma 30mm f/2.8 DN Art
10. Sony E 20mm f/2.8

Micro Four Thirds

WHEN it comes to choosing the very sharpest lenses for Micro Four Thirds, two specialist portrait primes top the pile. Panasonic's 42.5mm f/1.2 OIS, which at £1,100 is one of the most expensive lenses made for Micro Four Thirds, marginally edges the Olympus 75mm f/1.8, which costs about half the price.

The next section of the field comprises a cluster of fast primes covering the 15mm to 30mm range. While it's no surprise to see a couple more Panasonic Leica-branded primes here, its cult classic 20mm f/1.7 pancake also makes an appearance. This tiny, relatively inexpensive lens may be one of the oldest still available for Micro Four Thirds, but it's also one of the best in terms of image quality.

Olympus fans may be dismayed that its lenses aren't overly strongly featured here, with the 60mm f/2.8 Macro appearing next, essentially tying with Sigma's much cheaper but non-macro 60mm f/2.8. However, some of the firm's more recent lenses, including the highly regarded 40-150mm f/2.8 PRO, haven't yet been tested by DxOMark. We'd expect it to compete very closely with the Panasonic 35-100mm f/2.8 OIS for sharpness, which is the only zoom on this list.

SUPER FAST
Panasonic 42.5mm f/1.2
Tested on the Olympus E-M1

Top lenses under £2,000

1. Panasonic Leica DG Nocticron 42.5mm f/1.2 Asph OIS
2. Olympus M.Zuiko Digital ED 75mm f/1.8
3. Panasonic Leica Summilux DG 25mm f/1.4
4. Panasonic Leica DG 15mm f/1.7 Asph
5. Sigma 30mm f/1.4 DC DN C
6. Panasonic Lumix G 20mm f/1.7 II Asph
7. Olympus M.Zuiko Digital ED 60mm f/2.8 Macro
8. Sigma 60mm f/2.8 DN Art
9. Panasonic Lumix G 35-100mm f/2.8 OIS
10. Olympus M.Zuiko Digital ED 12mm f/2

Summary

SO, AFTER all this, what have we learned? Well, first, if it's out-and-out sharpness you're after, it's still better to buy primes rather than zooms. This is despite the fact that modern zooms are very good indeed, and noticeably better than those made 10 or 20 years ago. However, all of the same design and manufacturing advances that have enabled this advance have also been applied to primes, allowing them to maintain their optical edge.

Olympus's M.Zuiko Digital ED 75mm f/1.8 is one of its sharpest Micro Four Thirds lenses

Equally, on the whole you get what you pay for; it's no coincidence that many of the sharpest lenses are not just the most expensive, but also the largest and heaviest. Quite simply, this allows the optical designers to make the fewest compromises. Indeed, the very best modern lenses exemplified by the Zeiss Otus 55mm f/1.4 and the Sigma 50mm f/1.4 DG HSM A are very much larger and more complex than their older equivalents.

That said, the differences compared with smaller, cheaper options are often towards the extremes of the lens's performance, relating to sharpness at large apertures or towards the edges of the frame. These are enough to make a difference for sure, but might only be visible if you're displaying your images really large.

Because of this, it's still possible for enthusiast photographers to get excellent results from some comparatively inexpensive primes. For many DSLR users, the 50mm f/1.8 is still a great choice for excellent sharpness at a bargain price. APS-C users should also look at some wider options, for example Nikon's and Sony's 35mm f/1.8 optics, the Pentax 35mm f/2.4 or Canon's 24mm f/2.8 STM. Likewise, most mirrorless systems have compact fast primes that are a real step up from kit zooms. Of course, apart from better sharpness, they also have much larger maximum apertures for low-light shooting.

Naturally, buying a sharper lens is still only part of the story, and won't get you better pictures without learning and applying good photographic technique. But if you take on board everything else covered in this issue, it should get you well on the way to making the sharpest pictures your camera is capable of recording.

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Q I have a Nikon D300 and would like to know if the Nikon TC-201 2x converter would work with it.
From Necbob I, via the forum

A The Nikon TC-201 2x teleconverter is a very old model and isn't designed for use with AF lenses. On top of that, the TC-201 requires older lenses with an aperture ring if you want to be able to adjust the aperture. So the TC-201 may be cheap to buy, but it's really only of use for specialist applications. If you really want a converter, consider a 1.4x that will retain more image quality. An affordable choice might be the Kenko 1.4x Pro 300 for around £140. Kenko also makes an MC7 AF 2.0X DGX for Nikon, costing around £120. **Ian Burley**

Kenko's 1.4x Pro 300 teleconverter costs around £140

The LX100 has a 'hidden' EVF adjustment menu

LX100 viewfinder

Q In bright weather I have had difficulty seeing through both the screen and the viewfinder of my Panasonic Lumix DMC-LX100. I expected this with the screen but not the EVF. Do you know of any proprietary add-ons that might help? I am reluctant to resort to a black hood draped over my head, as in days gone by!
John Gibson

A Unfortunately the LX100's design provides no scope for adding an accessory eyecup to block out stray light from the viewfinder in bright conditions. As with many other cameras with corner-mounted EVFs, I find the best bet is simply to shield the top and side of the finder with my left hand when necessary.

One trick worth knowing about the LX100 is that you can also adjust the viewfinder's brightness, contrast and colour, increasing its visibility in bright light. However, this option is only ever displayed when you're viewing the menus with your eye to the viewfinder, which I for one never normally do. It appears next to the adjustment options for the LCD in the menu.

If you locate this and bring the camera up to your eye, it will suddenly appear. Increasing the EVF brightness should help with visibility in strong sunlight, and I also prefer to turn down the contrast and saturation to give a more neutral view.
Andy Westlake

Old lenses on new bodies

Q Soon I shall be treating myself to a Fuji X body, and plan to buy a few non-X-mount lenses. Is there a compatibility chart detailing which functions would still be available from a non-X lens (e.g. autofocus, metering, etc.) together with the converted focal length? Also, would I be able to use zooms and primes designed for cameras with smaller APS-C sensors, which I believe would give me a wider coverage than stated on the lens?
David Richards

A This is a fairly straightforward question to answer. There's no compatibility chart as such, simply because there are far too many lenses around to make this practical. But there are some simple rules about 'will' and 'will not' work.

First, as far as I'm aware, there are no electronic lens adapters for Fujifilm X cameras. This means adapted lenses won't autofocus and optical image stabilisation won't work. You won't be able to change the aperture from the camera body, either. If you try using lenses on which the aperture is set electronically – for example, Canon EF-mount lenses – you'll be restricted to shooting wide open all the time. So you're best off using older lenses that have their own aperture rings and easy-to-use manual focus rings.

However, metering and auto exposure will work just fine. Set the camera to aperture-priority mode and it will set the shutter speed to match the set aperture.

All Fujifilm cameras use APS-C sensors with a 1.5x crop factor. The equivalent focal length of any lens can be calculated by multiplying its actual focal length by 1.5x – meaning a 24mm becomes 36mm equivalent, and a 50mm lens, 75mm equivalent.

In principle you could try using lenses designed for sensors smaller than APS-C. But since lenses are invariably designed to give a specific image circle that matches the camera's film or sensor size, you are also likely to see vignetting and poor image quality at the edges of the frame, rather than a wider angle of view.
Andy Westlake

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In the bag

Wayne Johns has made a career from his fashion, beauty, commercial and advertising photography. Here we take a look at the items he always carries with him on a photoshoot. www.waynejohns.com

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Fujifilm X-Pro2 and Fuji X-T1

1 With their superb colour accuracy, beautiful sensors and excellent image quality, these are my tools. After 23 years of using Canon, I now use the Fujis for most of my commercial work, and I couldn't be happier. Superb performance and my kit bag is lighter!

Fujinon XF 35mm f/1.4 R

2 This is my standard lens, and it has a multitude of uses. I use it for full figure, fashion portraiture and even beauty shots. It's a fantastic all-rounder with a good, fast aperture and great optics. A new 35mm f/2 has just come out, which I'm keen to try.

Fujinon XF 56mm f/1.2 R

3 This particular Fujinon has to be one of my favourite lenses. It's an amazing piece of glass, with a fast aperture for beautiful, shallow depth of field together with fast focusing. The optics in this lens are just stunning.

Fujinon XF 50-140mm f/2.8 R LM OIS WR

4 This is a DSLR 70-200mm equivalent. It has fast and very quiet focusing, and an impressive image-stabilisation system for when shooting handheld, especially in low light.

PocketWizard Plus III

5 These are a must for me when using flash lighting in the studio or on location. They're solid and reliable. I have four – always handy to have, especially if my studio lights are out of sight where the slave units won't work.

Sekonic L-478D light meter

6 I always used a light meter in the days of film and have continued to do so. I like to have the ability to know the differences in exposure between my studio lights, so I can balance or build my shot as I wish.

List of kit 2x Fujifilm X-Pro2 bodies, Fujifilm X-T1 with grip, Fujinon 35mm f/1.4, Fujinon 56mm f/1.2, Fujinon 90mm f/2, Fujinon 50-140mm f/2.8, PocketWizard Plus III trigger/receivers, Sekonic L-478D light meter, X-Rite ColorChecker, SD card case, camera charger/batteries

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Professor Newman on...

The limitations of the JPEG

Bob Newman explains why the JPEG format isn't perfect and why its proposed replacement is no better

I was recently involved in a discussion about the relative merits of raw and JPEG file formats. In some sense, this relates to the old photography question of whether one would keep the negatives or not. The JPEG file is essentially a processed version of the raw file, so everything that is in a JPEG file can be recreated from the raw file. However, if the perceived quality of the JPEG file is brought about by some special and unreleased magic in the JPEG processing, it might not be so easy to reproduce it, whatever the theory.

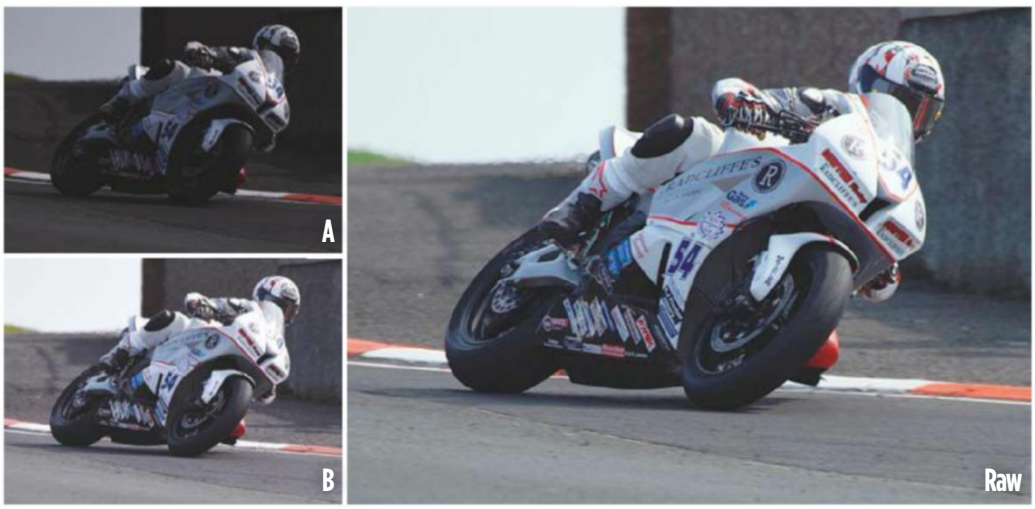
I have written before about my friend Iain and his fondness for his Leica X camera. Iain's preferred workflow has in the past been based on raw files, but in the case of the Leica, the particular magic (apart from the quality of the lens) is in the quality of the JPEG files. These happen to suit his tastes, but there have been plenty of reviews (including AP's own) that have not been as complimentary about them.

The problem here is that the JPEG files have distinct limitations. JPEG is an eight-bit-per-pixel/channel format, which means it can only record 256 different levels for each colour at each pixel location. This places a large constraint on what can be managed with respect to adjusting the image in post processing. If, for instance, your image is too dark and you try to brighten it, it is likely that there will be all kinds of colour artefacts caused by the lack of information in the shadows and highlights. The information was very likely present in the raw file, but it has been discarded in the processing to JPEG. This means that shooting for JPEG involves the kind of exposure management that went with colour slide film, and the effective exposure latitude is very small.

Some time ago I wrote about the JPEG 2000 (or JP2) standard – not surprisingly, published in the year 2000 – which overcomes more or less all the limitations of the original JPEG standard. Unfortunately, the JP2 file has become a historical curiosity, dormant for the past 16 years. The major reason for this is that no web browser supports JP2 files, so as an out-of-camera format it is of limited value in a world where many wish to post their images directly to social media. Thus, the web has stuck with the original JPEG format, and so have camera manufacturers.

Google has initiated a new move to change the formats of web images. As the provider of one of the most popular web browsers, Google should be in a position to replace JPEG. However, its candidate to replace the JPEG is a format called WebP. It is designed to offer more compression and higher final image quality than JPEG. However, it is still an eight-bit-per-pixel format, so, as far as a universal photographic file format is concerned, it is as limited as the original JPEG.

'Google has initiated a new move to change the formats of web images'



The straight out-of-camera JPEG image is too dark (A). Brightening the JPEG file results in a better image (B), but the version processed from the raw file, which is richer and much less compromised, retains a lot more shadow detail

Bob Newman is currently Professor of Computer Science at the University of Wolverhampton. He has been working with the design and development of high-technology equipment for 35 years and two of his products have won innovation awards. Bob is also a camera nut and a keen amateur photographer

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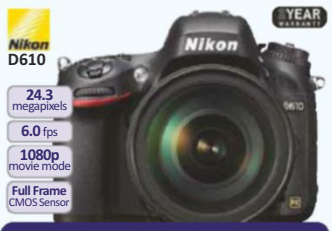

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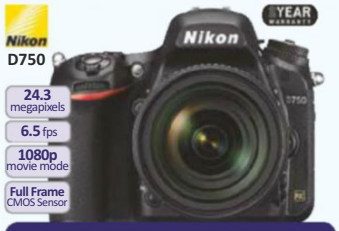

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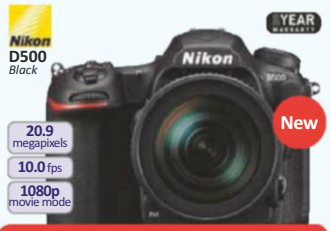

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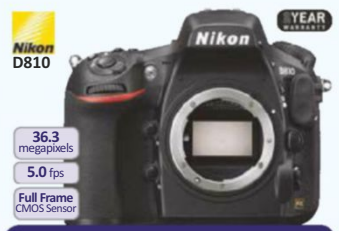

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5D Mark III Body **£2299**

5D Mark III Body **£2299**

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New

20.2 megapixels | 16.0 fps | Full Frame CMOS sensor

1D X Mk II Body **£5199**

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- 9cm Min Height

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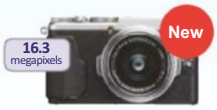
New

16.3 megapixels



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New

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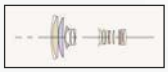

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CANON/NIKON FIT

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28mm f/2.8 IS USM	£389.00	400mm f/5.6L USM	£959.00	28-300mm f/3.5-5.6L IS	£1,879.00
35mm f/1.4L USM	£959.00	500mm f/4.0L IS MK II	£7,299.00	EF-S 55-250mm f/4-5.6 IS STM	£199.00
35mm f/1.4L II USM	£1,799.00	600mm f/4.0L IS MK II	£8,895.00	70-200mm f/2.8L IS II USM	£1,599.00
35mm f/2.0 IS USM	£379.00	800mm f/5.6L IS USM	£9,899.00	70-200mm f/2.8L USM	£945.00
40mm f/2.8 STM	£149.00	TSE 17mm f/4.0L	£1,589.00	70-200mm f/4.0L IS USM	£899.00
50mm f/1.2 L USM	£1,099.00	TSE 24mm f/3.5L II	£1,479.00	70-200mm f/4.0L USM	£529.00
50mm f/1.4 USM	£245.00	TSE 45mm f/2.8	£1,099.00	70-300mm f/4.0-5.6 IS	£369.00
50mm f/1.8 STM	£97.00	TSE 90mm f/2.8	£1,124.00	70-300mm f/4.0-5.6L IS USM	£1,029.00
EF-S 60mm f/2.8 Macro	£349.00	8-15mm f/4L Fisheye USM	£939.00	70-300mm DO IS USM	£899.00*
MP-E 65mm f/2.8	£779.00	EF-S 10-18mm IS STM	£185.00	75-300mm f/4.0-5.6 III	£188.00
85mm f/1.2L II USM	£1,499.00	EF-S 10-22mm f/3.5-4.5	£399.00	75-300mm f/4.0-5.6 III	£219.00
85mm f/1.8 USM	£279.00	EF 11-24mm f/4L USM	£2,249.00*	100-400mm L IS USM II	£1,799.00
100mm f/2 USM	£359.00	EF-S 15-85mm f/3.5-5.6 IS	£539.00	200-400mm f/4.0L USM	£8,598.00
100mm f/2.8 USM Macro	£373.00	16-35mm f/2.8L II USM	£1,060.00	1.4x III Extender	£314.00
100mm f/2.8L Macro IS	£699.00	16-35mm f/4.0L IS USM	£799.00	2x III Extender	£339.00
135mm f/2.0L USM	£769.00	17-40mm f/4.0L USM	£549.00	EF 12II Extension Tube	£79.99
180mm f/3.5L USM	£1,049.00	EF-S 17-55mm f/2.8 IS USM	£599.00	EF 25II Extension Tube	£139.99

Up to £590 cashback available when purchasing selected lenses with selected Canon DSLRs

Terms and conditions apply. Products can be purchased separately at any time during promo period. Offer available 23.03.2016 - 31.01.2017. See www.parkcameras.com for details.

CANON ACCESSORIES

Prices updated DAILY! See www.parkcameras.com/wdc for details.

Flashguns

Speedlite 90EX	£109.00
Speedlite 270EX II	£135.00
Speedlite 320EX	£185.00
Speedlite 430EX III-RT	£189.00*
Speedlite 600EX-RT	£429.00

*Price after £20 cashback from Canon

Printers

PIXMA PRO-100s	£375.00
PIXMA PRO-10s	£529.00
PIXMA PRO-1	£628.00

Battery Grips

BG-E11 (5D III, 5Ds/R)	£225.00
BG-E13 (6D)	£174.00
BG-E14 (70D)	£149.00
BG-E16 (7D Mark II)	£249.00
BG-E18 (7D Mark II)	£115.00

For even more grips, see website

Bags

Backpack BP100	£59.99
Holster HL100	£26.49
Shoulder Bag	£29.99

Spare batteries

LP-E19 (1D X Mark II)	£149.00
LP-E4N (1D X, 1D C)	£139.99
LP-E6N (5D III, 7D II, 6D)	£69.00
LP-E8 (700D, 600D)	£35.00
LP-E10 (1300D, 1200D)	£39.99
LP-E17 (760D, 750D, M3)	£44.00

For even more batteries, see website

Scanners

CanoScan LiDE 220	£89.00
CanoScan 9000F Mark II	£168.00

NIKON LENSES

Prices updated DAILY! Visit us in store, online at parkcameras.com or call our expert team on 01444 23 70 65

AF-G 10.5mm f/2.8G ED DX	£549.00	AF-D 60mm f/2.8 Micro	£368.00	AF-S 800mm f/5.6E FL ED VR	£12,990.00
AF-D 14mm f/2.8D	£1,199.00	AF-S 60mm f/2.8G Micro ED	£439.00	AF-S 10-24mm f/3.5-4.5G	£639.00
AF-D 16mm f/2.8D Fisheye	£625.00	AF-S 85mm f/3.5G DX	£389.00	AF-S 16-80mm f/2.8-4E ED VR	£769.00
AF-S 20mm f/1.8G ED	£579.00	AF-S 85mm f/1.8G	£399.00	AF-S 16-85mm f/3.5-5.6G	£499.00
AF-D 20mm f/2.8	£463.00	AF-S 105mm f/2.8G VR	£659.00	AF-S 17-35mm f/2.8 IF ED	£1,347.00
AF-D 24mm f/2.8D	£369.00	AF-DC 105mm f/2 Nikkor	£805.00	AF-S 17-55mm f/2.8G DX	£979.00
AF-S Nikkor 24mm f/1.4G	£1,379.00	AF-D 135mm f/2.0D	£1,029.00	AF-S 18-35mm f/3.5-4.5G	£519.00
AF-D 28mm f/2.8	£245.00	AF-D 180mm f/2.8 IF ED	£695.00	AF-S 18-105mm VR	£204.00
AF-S 28mm f/1.8G	£495.00	AF-D 200mm f/4D IF ED	£1,179.00	AF-S 18-140mm ED VR DX	£429.00
35mm f/2 AF Nikkor D	£255.00	AF-S 200mm f/2G ED VR II	£4,099.00	AF-S 18-200mm ED DX VR II	£534.00
AF-S 35mm f/1.8G ED	£399.00	AF-S 300mm f/2.8G ED VR II	£3,999.00	AF-S 18-300mm f/3.5-6.3 VR	£549.00
AF-S 35mm f1.8G DX	£151.00	AF-S 300mm f/4 D IF-ED	£999.00	AF-S 24-85mm VR	£359.00
AF-S 40mm f/2.8G ED	£199.00	AF-S 300mm f/4E PF ED VR	£1,499.00	AF-S 28-300mm ED VR	£699.00
AF 50mm f/1.4D	£244.00	AF-S 400mm f/2.8 FL ED VR	£8,999.00	AF-S 55-200mm f/4-5.6G VR II	£229.00
AF-S 50mm f/1.4G	£349.00	AF-S 500mm f/4G ED VR	£5,849.00	AF-S 70-200mm f/2.8 VR II	£1,679.00
AF-D 50mm f/1.8	£109.00	AF-S 500mm f/4E FL ED VR	£8,149.00	AF-S 70-300mm IF ED VR	£429.00
AF-S 50mm f/1.8G	£169.00	AF-S 600mm f/4E FL ED VR	£9,649.00	AF-S 200-400mm VR II	£5,199.00

For up to **£150 cashback** on selected Nikon lenses, see in store or visit **www.parkcameras.com/nikon-lens-cashback**

Sony a6000

24.3 MEGA PIXELS | Wi-Fi / NFC

Body only £439.00 | + 16-50mm £499.00

Protect your screen with Sony PCK-LM17 LCD protectors for £13.00

Sony RX100 IV

20.1 MEGA PIXELS | 2.9x

In stock at only £759.00 | See website for RX100 IV cases

Add a Sony NP-BX1 spare battery for only £39.99

Sony a6300

24.2 MEGA PIXELS | 4K

Body only £999.00 | + 16-50mm £1,099.00

Add a Sony NP-FW50 spare battery for £64.95

Sony a7 II

24.3 MEGA PIXELS | IS

Body only £1,179.00 | Add a VG-C2EM grip for £289

Add a Sigma mount converter MC-11 (Sony E → Canon EF) for only **£189**

Sony a7S II

12.2 MEGA PIXELS | IS

Body only £2,499.00 | Add a Sony F43M flash for £260

Add a Metabones Canon EF to E-mount T IV Adaptor for only **£200**

Sony a7R II

42.4 MEGA PIXELS | IS

Body only £2,599.00 | Add a Sony NP-FW50 for £56

Limited numbers back in stock! See website for availability

E-Series

16mm f/2.8 Pancake	£169.00	16-70mm f/4G ZA OSS	£725.00
24mm f/1.8 ZA Carl Zeiss	£679.00	18-200mm f/3.5-6.3 P. Zoom	£849.00
24mm f/2.0 Carl Zeiss T*	£949.00	24-70mm f/4 FE Vario-Tessar T*	£805.00
50mm f/1.8 OSS	£199.00	24-240mm f/3.5-6.3 FE OSS	£749.00
55mm f/1.8 FE Sonnar T* ZA	£618.00	28-70mm f/3.5-5.6 FE OSS	£449.00
90mm F2.8 Macro G FE OSS	£969.00	28-135mm f/4 G FE PZ OSS	£1,899.00
10-18mm f/4 OSS	£629.00	55-210mm f/4.5-6.3 OSS	£239.00
16-50mm f/3.5-5.6 OSS	£259.00	70-200mm f/4 G FE OSS	£999.00

Alpha-Series

30mm f/2.8 SAM 1:1 Macro DT	£150.00
35mm f/1.8 DT	£149.00
50mm f/1.4 Carl Zeiss	£1,099.00
11-18mm f4.5-5.6 DT	£509.00
16-35mm f/2.8 Carl Zeiss T*	£1,399.00
24-70mm f/2.8 II Carl Zeiss T*	£1,799.00
55-200mm f4.0-5.6 SAM DT	£179.00
70-200mm f/2.8 G SSM II	£2,199.00

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OLYMPUS pen-F

20.3 MEGA PIXELS | 10 FPS | 3.0" | IS | 1080p

The Olympus PEN-F is a beautifully designed mirrorless camera that produces equally impressive images. The Creative Dial feature makes adding filters quick and simple, and its category-leading release time lag and 5-axis image stabilisation system means that even more expensive digital SLR cameras should be feeling threatened, as the PEN-F punches well above its weight.

Body only **£999.00** | +17mm f/1.8 **£1,199.00**

Panasonic LUMIX GX80

16.0 MEGA PIXELS | Wi-Fi / NFC | 3.0" | 4K PHOTO | IS | 4K | £50 cashback

Capture those unmissable moments and preserve life memories and experiences that happen in fleeting moments. The LUMIX GX80 reacts as quickly as you do – Shoot, select & save with 4K Photo.

Body only **£509.00*** | +12-32mm **£549.00*** | Twin lens kit **£679.00***

*Prices include £50 cashback from Panasonic. Available 16.06.16 - 05.09.16.

Olympus E-M10 Mark II

16.2 MEGA PIXELS | 8 FPS

Body only **£449.00** | +14-42mm **£549.00**

See website for the limited edition **Fox Brown** version!

Olympus E-M5 Mark II

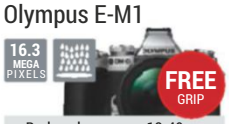
16.1 MEGA PIXELS | IS

Body only **£749.00** | + 12-50mm **£849.00**

Add the Olympus HLD-8 battery grip for the E-M5 II for £194.00

Olympus E-M1

16.3 MEGA PIXELS | FREE GRIP



Body only **£849.00** | + 12-40mm **£1,233.00**

Claim a **FREE** Olympus HLD-7 batt. grip from Olympus! Ends 30.09.16

Panasonic GX8

20.3 MEGA PIXELS | Wi-Fi / NFC | £50 cashback

Body only **£769.00** | + 14-60mm **£819.00***

*Price includes **£50 cashback** from Panasonic. Ends 05.09.16.

Panasonic GH4R

16.0 MEGA PIXELS | 4K PHOTO | £50 cashback

Body only **£949.00*** | + 14-140mm **£1,299.00***

*Prices include **£50 cashback** from Panasonic. Ends 05.09.16.

PANASONIC LENSES

14mm f/2.5 II Pancake	£299.00
20mm f/1.7 II ASPH	£269.00
45mm f/2.8 Macro	£498.00
42.5mm f/1.2 O.I.S	£1,099.00
7-14mm f/4.0 ASPH	£739.00
12-60mm f/3.5-5.6 ASPH	£359.00
14-140mm f/3.5-5.6	£405.00
35-100mm f/2.8 O.I.S	£799.00
45-175mm f/4.0-5.6 O.I.S	£279.00
100-300mm f/4-5.6 O.I.S	£378.00
100-400mm f/4.0-6.3	£1,349.00

See website for even more lenses!

Olympus 7-14mm f/2.8 Pro

SRP £999.99

In stock at only **£837.50**

Take this lens out on a **FREE test drive!** See website for details.

OLYMPUS LENSES

12mm f/2.0	£549.00
17mm f/1.8 M. ZUIKO	£349.00
25mm f/1.8 M. ZUIKO	£279.00
45mm f/1.8	£179.00
60mm f/2.8 Macro	£349.00
7-14mm f/2.8 PRO	£837.50
12-40mm f/2.8 PRO	£719.00
14-42mm f/3.5-5.6 II R MFT	£239.00
40-150mm f/4-5.6 R M. ZUIKO	£149.00
40-150mm f/2.8 PRO + 1.4x	£1,249.00
75-300mm f/4.8-6.7 ED II	£349.00

See website for even more Olympus lenses!

Olympus TG-TRACKER

4K | NEW!

COMING SOON! **£279.00** | Available in black, or green

Add an Olympus Li-50B spare battery for only £44.99

Panasonic LX100

12.8 MEGA PIXELS | 4K PHOTO

In stock at only **£529.00** | Add the MS2E mic for £279

Add a Panasonic DMW-BLG10 spare battery **for £59.99**

Panasonic FZ330

24x | 4K PHOTO

In stock at only **£449.00** | Add the BLC12 batt for £49

Add a Lexar 32GB 1000x UHS-II Pro SD card for **only £25**

Panasonic TZ100

10x | 4K PHOTO

In stock at only **£549.00** | Add the BLG10 batt for £59

Add a Lexar 32GB 1000x UHS-II Pro SD card for **only £25**

PENTAX K-1

36.4 MEGA PIXELS | 5 FPS | 3.2" | IS | 1080p | Pro Centre PENTAX

The K-1 features a 36.4 megapixel full-frame sensor with an AA filter simulator, Full HD video, a new SR II 5-axis shake reduction mechanism, and is compatible with numerous lenses.

Limited stock now available!!

Body SRP £1,599.00

FUJIFILM X-T2

24.3 MEGA PIXELS | 14 FPS | 3.0" | SD card | 4K

Body SRP ~~£1,399.00~~

The outstanding X-T2 is the flagship model of the X-Series and boasts a 24.3MP sensor without a low-pass filter, 4K video recording, & offers numerous technical improvements over its predecessor, the X-T1.

PRE-ORDER & receive £100 off the price of the battery grip when purchased together! See **www.parkcameras.com/fujifilm-x-t2**

NEW!

Pentax K-S2

16.1 MEGA PIXELS | 8 FPS

Body only **£469.00** | + 18-50mm WR **£529.00**

Add a Pentax remote control F for only £21.90.

Pentax K-3 II

24.3 MEGA PIXELS

Body only **£709.00** | + 18-135mm WR **£1,009.00**

Add a Pentax D-BG5 battery grip for only £149.00

Pentax K-70

24.2 MEGA PIXELS | NEW!

NEW & COMING SOON!

Pre-order to receive one of the first available stock! See web for details

Fujifilm X-T1

16.7 MEGA PIXELS | £100 TRADE-IN BONUS

Body only **£795.00** | + 18-55mm **£1,049.00**

Receive **£100 off the X-T1** when trading in selected cameras! See web.

Fujifilm X-PRO2

24.3 MEGA PIXELS | £100 TRADE-IN BONUS

Body only **£1,349.00** | Cashback available with selected lenses! See website

Receive **£100 off the X-PRO2** when trading in selected cameras! See web.

Get up to £120 cashback on XF lenses

XF 16mm f/1.4 R WR	£749.00
XF 23mm f/1.4	£669.00
XF 35mm f/2 R WR	£299.00
XF 56mm f/1.2	£769.00
XF 56mm F1.2 APD	£1,069.00
XF 90mm f/2 R LM WR	£669.00
XF 10-24mm f/4 OIS	£749.00
XF 50-140mm f/2.8 WR OIS	£1,159.00

DOUBLE the cashback when bought with selected X-series cameras! Ends 31.08.16

SAMYANG LENSES

Prices updated DAILY! Visit us in store, online at parkcameras.com or call our expert team on 01444 23 70 60

Samyang 24mm T1.5 VDSLR II

In stock at only **£475.00**

Available in Canon, Nikon, Sony or Micro 4/3 fits. See website for details.

Samyang 35mm T1.5 VDSLR II

In stock at only **£375.00**

Available in Canon, Nikon, Sony or Micro 4/3 fits. See website for details.

Samyang 50mm T1.5 VDSLR AS UMC

In stock at only **£399.00**

Available in Canon, Nikon, Sony or Micro 4/3 fits. See website for details.

7.5mm Fisheye f/3.5	£209.00
8mm Fisheye F/2.8 II	£213.00
8mm T3.8 VDSLR II	£279.00
10mm f/2.8 ED	£299.00
12mm f/2.0 NCS	£249.99
12mm T2.2 VDSLR NCS CS	£329.00
14mm f/2.8	£269.99
14mm T3.1 VDSLR II	£289.00
16mm f/2.0	£295.00
16mm T2.2 VDSLR II	£379.00
21mm f/1.4 CSC	£269.00
21mm T1.5 V-CSC	£299.00
24mm f/1.4	£439.00
24mm f/3.5 TSE	£625.00
35mm f/1.4	£399.00
50mm f/1.2 CSC	£279.00
50mm T1.3 V-CSC	£329.00
50mm f/1.4	£283.00
85mm f/1.4	£229.00
85mm T1.5 VDSLR II	£269.00
100mm Macro f/2.8	£314.99
100mm Macro T3.1 VDSLR	£349.99
135mm f/2.0 ED UMC-Canon	£347.00
135mm T2.2 VDSLR ED UMC	£361.00
500mm f/6.3 Reflex	£114.00
500mm f/8.0 Reflex	£95.00
800mm f/8.0 Reflex	£169.00
650-1300mm f/8.0-16.0	£250.00

Visit our website for full details on all the Samyang lenses, as well as deals on filters!

Sunpak Ultra Pro 423 Carbon Fibre Tripod

In stock at only **£84.00**

CamRanger Wireless Camera Control

In stock at only **£239.99**

360FLY Action cam

In stock at only **£399.00**

SIGMA LENSES

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Sigma MC-11 Mount Converter

NEW!

Limited stock now available!

£199.00

Use your Canon / Sigma lenses with a Sony E-mount camera

Sigma 50-100mm f/1.8 DC HSM | ART

NEW!

Limited stock now available!

£829.00

Available in Canon, Nikon or Sigma fits. See website for details.

Sigma 150-600mm f/5-6.3 Sports + TC-1401 Kit

(£1,428 when bought separately)

£1,299.00

Available in Canon, Nikon or Sigma fits. See website for details.

4.5mm f/2.8 Fisheye EX DC	£599.00
8mm f/3.5 Circ. Fish EX DG	£599.00
15mm f/2.8 Diag F/eye EX DG	£499.00
19mm f/2.8 DN	£119.00
20mm f/1.4 DG HSM	£629.00
24mm f/1.4 DG HSM	£599.00
30mm f/1.4 DC HSM	£299.00
30mm f/2.8 DN	£119.00
35mm f/1.4 DG HSM	£599.00
50mm f/1.4 DG HSM (Art)	£579.00
60mm f/2.8 DN	£119.00
85mm f/1.4 EX DG HSM	£619.00
105mm f/2.8 EX DG OS HSM	£329.00
150mm f/2.8 OS Macro	£649.00
180mm f/2.8 EX DG OS HSM	£1,099.00
300mm f/2.8 APO EX DG	£2,199.00
500mm f/4.5 APO EX DG	£3,599.00
8-16mm f/4.5-5.6 DC HSM	£499.00
10-20mm f/3.5 EX DC HSM	£329.00
12-24mm f/4.5-5.6 II DG HSM	£529.00
17-50mm f/2.8 DC OS HSM	£279.00
17-70mm f/2.8-4 DC OS	£319.00
18-35mm f/1.8 DC HSM	£549.00
18-200mm f/3.5-6.3 DC OS HSM	£249.00
18-250mm DC Macro OS HSM	£279.00
18-300mm f/3.5-6.3 DC Macro	£349.00
24-35mm f/2 DG HSM Art	£699.00
24-70mm f/2.8 IF EX DG	£549.00
24-105mm f/4 DG OS HSM	£599.00
50-500mm f/4.5-6.3 OS HSM	£849.00
70-200mm f/2.8 OS	£729.00
70-300mm f/4.0-5.6 DG Macro	£99.00
70-300mm f/4.0-5.6 APO Macro	£149.00
120-300mm f/2.8 DG OS HSM	£2,499.00
150-500mm f/5.0-6.3 DG OS	£494.99
150-600mm f/5-6.3 DG | C	£739.00
150-600mm Cont. + 1.4x	£849.00
150-600mm f/5-6.3 DG | S	£1,199.00
150-600mm Sport + 1.4x	£1,299.00
300-800mm f/5.6 EX DG HSM	£5,499.00
1.4x Teleconverter APO EX DG	£179.00
1.4x Teleconverter TC1401	£229.00
2.0x Teleconverter APO EX DG	£199.00
2.0x Teleconverter TC2001	£269.00
USB Dock	£39.99

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ETRS Body + WLF ..... E+ £89
ETR Body Only ..... E+ £79
45-90mm F4-5.6 PE ..... E++ £399
50mm F2.8 PE ..... E++ £149
70-140mm F4.5 PE ..... E++ £599
100mm F4 E Macro ..... E+ £149
150mm F3.5 E ..... As Seen / E+ £29 - £109
150mm F3.5 PE ..... E+ / E++ £99 - £119
180mm F4.5 PE ..... E+ £159
200mm F4.5 E ..... E+ / E++ £69 - £179
200mm F5.6 E ..... E++ £79
250mm F5.6 E ..... E+ / E++ £79 - £129
250mm F5.6 PE ..... E+ £99
220 E Mag ..... E++ £15
220 Ei Mag ..... E++ £25
Polaroid Mag E ..... E+ / E++ £20 - £25
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Extension Tube E42 ..... E++ £39
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Prism Finder E ..... As Seen £29

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SQB Complete + Grip ..... E+ £299
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200mm F4.5 S ..... E++ £129
250mm F5.6 PS ..... E+ £129
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SQA 120 Mag ..... E+ £39
SQA 220J Mag ..... E+ £75
Polaroid Mag S ..... E+ £25
AE Prism Finder S ..... E+ £79
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Prism Finder S ..... As Seen £29
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EOS 1N Body Only ..... E+ £79 - £89
EOS 1 + E1 Booster ..... As Seen / E+ £79
EOS 1 Body Only ..... E+ £79 - £89
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20-35mm F3.5-4.5 USM ..... E++ £159
22mm F2 STM ..... Mint- £89
24mm F3.5 L TSE ..... E+ £699
24mm F3.5 L TSE MkII ..... Mint- £1,149
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24-70mm F4 L IS USM ..... Mint- £489 - £579
24-105mm F4 L IS USM ..... Exc / E++ £349 - £429
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28mm F2.8 EF ..... E++ £99
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50mm F1.0 L USM ..... Mint- £2,750
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50mm F1.4 USM ..... E++ / Mint- £169 - £199
50mm F1.8 EF Mk1 ..... E++ £99 - £115
55-200mm F4.5-5.6 USM II ..... E++ £59
55-250mm F4-5.6 EFS IS ..... E+ £89
60mm F2.8 EFS Macro ..... E++ / Mint- £239 - £249
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70-200mm F2.8 L USM ..... E++ £529 - £549
70-200mm F4 L IS USM ..... E++ / Mint- £629
70-200mm f4 L USM ..... E+ / E++ £279 - £339
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75-300mm F4-5.6 EF ..... E+ £59
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75-300mm F4-5.6 IS USM ..... E+ / E++ £189 - £199
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80-200mm F4.5-5.6 USM ..... E+ £49
85mm F1.2 L USM ..... E+ £799
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M4 Chrome Body Only ..... E+ £599
M3 Chrome Body Only ..... E+ £549
CL + 40mm F2 ..... E+ £549
CL Black Body Only ..... E+ £299
Konica Hexar RF Limited Edition ..... Mint £2,449
Konica Hexar RF + 50mm F2 + Flash ... E+ / E++ £749 - £799
Konica Hexar RF Body Only ..... E++ £389
16/18/21mm F4 Tri Elmar + Finder ..... Mint- £2,989
21mm F2.8 Asph M Black ... E++ / Mint- £1,399 - £1,499
21mm F2.8 Asph M Black 6bit ..... E++ £1,499
21mm F2.8 M Black ..... Exc / E++ £849 - £1,199
21mm F2.8 M Black + Finder ..... E+ £999
21mm F3.4 Black ..... E+ £599
21mm F3.4 Super Elmar ..... Mint- £1,799
21mm F4 Chrome + Finder ..... E+ £1,149
24mm F2.8 Asph M Black ..... Exc / Mint- £949 - £1,349
24mm F2.8 Asph M Black 6bit ..... E++ £1,489
24mm F3.8 Asph M Black ..... E+ / Mint- £1,089 - £1,199
28/35/50 F4 Tri Elmar ..... E++ £2,399
28mm F2 Asph M Black ..... E+ £1,399
28mm F2 Asph M Black 6bit ... E+ / E++ £1,449 - £1,589
28mm F2.8 Asph M Black 6bit ..... Mint- £1,129 - £1,149
28mm F2.8 M Black ..... E+ £689
35mm F1.4 Asph M Black ..... E+ £1,689
35mm F1.4 Asph M Black 6bit E+ / E++ £1,689 - £2,749
35mm F2 Asph M Black ..... E++ £1,149
35mm F2 Asph M Chrome ..... E+ £1,289
35mm F2 Black ..... E+ £799
35mm F2 M Black ..... E+ £949
35mm F2.4 Asph M Black 6bit ..... Mint- £1,149

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Ink Cartridges

We carry one of the largest ranges of printer ink cartridges in the UK, with cartridges in stock for practically every inkjet printer. We always stock **Original** cartridges, which are made by your printer manufacturer, and in many cases we also offer **Compatible** cartridges, which are usually made by a UK company called **Jet Tec**. Using **Jet Tec Compatibles** is a way of saving money, without compromising on the quality of your prints.

Here are the results from two independent ink tests that agree...

Digital Photography Ink Test Winner ★★★★★

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Canon

PGi29 Pixma Pro 1
Originals:
Set of 12 £229.99
Colours 36ml each £19.99

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Originals:
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Colours 13ml each £9.99
Compatibles:
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Colours 14ml each £3.99

CLi8 Pixma Pro 9000
Originals:
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Compatibles:
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Colours 14ml each £3.99

PGi9 Pixma Pro 9500
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Colours 14ml each £8.99
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PGi525/CLi526 Set of 5 £42.99
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PGi550/CLi551 Set of 5 £37.99
PGi550 Black 15ml £9.99
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PGi550/CLi551XL Set of 5 £54.99
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CLi551XL Colours 11ml £10.99
PG540 Black 8ml £10.99
PG540XL Black 21ml £15.99
CL541 Colour 8ml £13.99
CL541XL Colour 15ml £15.99
PG545XL Black 15ml £13.99
CL546XL Colour 13ml £15.99
Compatibles:
PGi5 Black 27ml £4.99
CLi8 Colours 13ml £3.99
PGi5/CLi8 Set of 5 £19.99
PGi520 Black 19ml £4.99
CLi521 Colours 9ml £3.99
PGi520/CLi521 Set of 5 £19.99
PGi525 Black 19ml £4.99
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PGi525/CLi526 Set of 5 £19.99
PGi550XL Black 25ml £4.99
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PGi550/CLi551XL Set of 5 £19.99
BCi6 Colours 15ml £2.99
PG40 Black 28ml £12.99
CL41 Colour 24ml £16.99
PG50 Black 28ml £12.99
CL51 Colour 24ml £14.99
PG510 Black 11ml £13.99
CL511 Colour 11ml £15.99
PG512 Black 18ml £13.99
CL513 Colour 15ml £15.99
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CL541XL Colour 15ml £14.99
PG545XL Black 15ml £11.99
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Many more in stock!

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No.16 Fountain Pen Inks
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No.16XL Black 12.9ml £14.99
No.16XL Colours 6.5ml each £11.99
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No.16 Black 12ml £3.99
No.16 Colours 12ml each £3.99

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No.18 Colours 3.3ml each £5.99
No.18XL Set of 4 £42.99
No.18XL Black 11.5ml £14.99
No.18XL Colours 6.6ml each £11.99
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No.24 Colours 7ml each £3.99

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Originals:
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No.26 Black 6.2ml £8.99
No.26 Colours 4.5ml each £7.99
No.26XL Set of 4 £49.99
No.26XL Black 12.1ml £14.99
No.26XL Colours 9.7ml each £13.99
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Colours 13ml each £3.99

T0541-T0549 Frog Inks
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Colours 13ml each £14.99
Compatibles:
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Colours 13ml each £3.99

T0591-T0599 Lily Inks
Originals:
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Compatibles:
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Colours 13ml each £3.99

More Epson inks >>>

Albums & Frames

We now stock a comprehensive range of frames, mounts, albums and accessories. The full range can be viewed on our website, with detailed close-up images of each product to help you choose the perfect way to display your printed photographs. Below is just a tiny sample of what we offer:

Grace Albums Available in Burgundy or Blue.

Emilia Frames Distressed wood shabby chic effect. Blue or White.

Travel Albums Over a dozen designs in stock.

Rio Frames Handcrafted solid wood with 30mm wide profile, in four colours.

Grafton Albums Available in Burgundy or Blue.

Frisco Frames Simple, basic design available in a huge range of sizes & colours.

Baby Albums Multiple different designs available.

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Grace 6x4 200 photos £9.99
Grace 6x4 300 photos £14.99
Grace 7x5 100 photos £7.99
Grace 7x5 200 photos £13.99
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Grafton 6x4 200 photos £9.99
Grafton 7x5 200 photos £13.99
Baby 6x4 200 photos £9.99
Travel 6x4 200 photos £8.99

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Grafton 29x32cm 100 pgs £14.99
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Frisco 8x6 seven colours £2.79
Frisco 9x6 seven colours £3.49
Frisco 10x8 seven colours £3.79
Frisco 12x8 seven colours £4.59
Frisco A4 seven colours £3.99
Frisco A3 seven colours £8.99

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Emilia 7x5 two colours £5.99
Emilia 8x6 two colours £6.99
Emilia 10x8 two colours £7.99
Emilia 12x8 two colours £8.99
Rio 6x4 four colours £5.99
Rio 7x5 four colours £6.99
Rio 8x6 four colours £7.99
Rio 10x8 four colours £8.99
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Colours 5.5ml each £8.99
Compatibles:
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Black 7.4ml £4.99
Colours 5.5ml each £3.99

T0791-T0796 Owl Inks
Originals:
Set of 6 £72.99
Colours 11.1ml each £12.99
Compatibles:
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Colours 11.1ml each £3.99

T0801-T0806 Hummingbird Inks
Originals:
Set of 6 £49.99
Colours 7.4ml each £8.99
Compatibles:
Set of 6 £19.99
Colours 7.4ml each £3.99

T0871-T0879 Flamingo Inks
Originals:
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Colours 11.4ml each £9.99
Compatibles:
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Colours 11.4ml each £3.99

T0961-T0969 Husky Inks
Originals:
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Colours 11.4ml each £8.99
Compatibles:
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Colours 11.4ml each £3.99

T1571-T1579 Turtle Inks
Originals:
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Colours 25.9ml each £18.99

T7601-T7609 Killer Whale
Originals:
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Colours 25.9ml each £18.99

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Originals:
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No.62XL Colour 11.5ml £23.99
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No.300 Colour 4ml £12.99
No.301 Black 3ml £9.99
No.301 Colour 3ml £11.99
No.301XL Black 8ml £18.99
No.301XL Colour 6ml £18.99
No.350 Black 4.5ml £11.99
No.351 Colour 3.5ml £14.99
No.363 Black 6ml £13.99
No.363 C/M/Y/PC/PM each £9.99
No.363 SET OF 6 £39.99
No.364 Black 6ml £7.99
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No.364XL Black 14ml £13.99
No.364XL PB/C/M/Y 6ml each £12.99
No.364XL SET OF 4 £49.99
No.920XL SET OF 4 £46.99
No.932XL SET OF 4 £43.99
No.950XL SET OF 4 £69.99
Compatibles:
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No.21 Black 10ml £7.99
No.22 Colour 21ml £11.99
No.45 Black 45ml £4.99
No.56 Black 24ml £9.99
No.57 Colour 24ml £12.99
No.78 Colour 36ml £9.99
No.110 Colour 12ml £10.99
No.300XL Black 18ml £14.99
No.300XL Colour 18ml £16.99
No.301XL Black 15ml £14.99
No.301XL Colour 18ml £16.99
No.337 Black 21ml £10.99
No.338 Black 21ml £10.99
No.339 Black 34ml £12.99
No.343 Colour 21ml £12.99
No.344 Colour 21ml £14.99
No.348 Photo 21ml £12.99
No.350XL Black 30ml £14.99
No.351XL Colour 20ml £16.99
No.363 Black 20ml £6.99
No.363 Colours 6ml each £4.99
No.363 SET OF 6 £24.99
No.364 Black 10ml £4.99
No.364 Colours 5ml each £3.99
No.364 SET OF 4 £15.99
No.364XL Black 18ml £8.99
No.364XL Colours 11ml each £7.99
No.364XL SET OF 4 £31.99
No.920XL SET OF 4 £19.99
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A4 100 sheets +100 FREE £19.99
Photo Glossy 200gsm:
6x4 100 sheets +100 FREE £9.99
A4 20 sheets £6.99
Premium Pearl 270gsm:
6x4 50 sheets +50 FREE £6.99
A4 20 sheets +20 FREE £8.99
Premium Gloss 270gsm:
A4 25 sheets OFFER £8.99
A3 25 sheets OFFER £15.99
A3+ 25 sheets OFFER £19.99
Smooth Pearl 310gsm:
6x4 100 sheets £14.99
7x5 100 sheets £17.99
A4 25 sheets £12.99
A4 100 sheets £39.99
A4 250 sheets £84.99
A3 25 sheets £25.99
A3+ 25 sheets £35.99
17" Roll 30 metres £69.99
24" Roll 30 metres £96.99
Smooth Gloss 310gsm:
6x4 100 sheets £14.99
7x5 100 sheets £17.99
A4 25 sheets £12.99
A4 100 sheets £39.99
A3 25 sheets £25.99
A3+ 25 sheets £35.99
Premium Matt Duo 200 gsm:
A4 50 sheets £12.99
A3+ 50 sheets £34.99
Heavy Duo Matt 310gsm:
A4 50 sheets £17.99
A3+ 50 sheets £44.99
Gold Fibre Silk 310gsm:
A4 50 sheets £37.99
A3+ 50 sheets £89.99
Gold Mono Silk 270gsm:
A4 25 sheets £16.99
A3+ 25 sheets £42.99

Fotospeed

Smooth Pearl 290gsm:
6x4 100 sheets £12.99
7x5 100 sheets £16.99
A4 50 sheets £17.99
A3 50 sheets £34.99
A3+ 25 sheets £25.99
Panoramic 25 sheets £26.99
17" Roll 30 metres £68.99
24" Roll 30 metres £85.99
PF Lustre 275gsm:
6x4 100 sheets £12.99
7x5 100 sheets £16.99
A4 50 sheets £17.99
A3 25 sheets £35.99
A3+ 50 sheets £47.99
Panoramic 25 sheets £26.99
17" Roll 30 metres £69.99
24" Roll 30 metres £86.99
PF Gloss 270gsm:
A4 50 sheets £17.99
A3 50 sheets £35.99
A3+ 50 sheets £47.99
Panoramic 25 sheets £26.99
Matt Ultra 240gsm:
A4 50 sheets £12.99
A3 50 sheets £26.99
A3+ 50 sheets £35.99
Fine Art / Fibre Base Papers:
Baryta A4 20 sheets £21.99
Bartya A3 20 sheets £42.99
Etching A4 25 sheets £19.99
Etching A3 25 sheets £34.99
Smooth Cotton A4 25 sh £24.99
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Canon

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A4 20 sheets £11.99
A3 20 sheets £27.99
A3+ 20 sheets £36.99
PT-101 Pro Platinum 300gsm:
6x4 20 sheets £7.99
A4 20 sheets £16.99
A3 20 sheets £37.99
A3+ 10 sheets £24.99
SG-201 Semi-Gloss 260gsm:
6x4 50 sheets £9.99
A4 20 sheets £11.99
A3 20 sheets £27.99
A3+ 20 sheets £42.99
LU-101 Pro Lustre 260gsm:
A4 50 sheets £14.99
A3 50 sheets £32.99
A3+ 50 sheets £49.99

Parma Jet

Smooth Pearl 280gsm:
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7x5 100 sheets £18.99
A4 50 sheets £18.99
A4 50 sheets £18.99
A3 50 sheets £35.99
A3+ 25 sheets £28.99
17" Roll 30 metres £64.99
24" Roll 30 metres £89.99
Ultra Pearl 295gsm:
6x4 100 sheets £14.99
7x5 100 sheets £20.99
A4 25 sheets £12.99
A3 25 sheets £22.99
A3+ 25 sheets £30.99
13" Roll 10 metres £21.99
17" Roll 30 metres £68.99
24" Roll 30 metres £92.99
Titanium Lustre 280gsm:
A4 25 sheets £22.99
A3 25 sheets £44.99
A3+ 25 sheets £62.99
Oyster 271gsm:
6x4 100 sheets £12.99
7x5 100 sheets £18.99
A4 50 sheets £18.99
A3 25 sheets £22.99
A3+ 25 sheets £28.99
13" Roll 10 metres £26.99
17" Roll 30 metres £64.99
24" Roll 30 metres £89.99
Gloss 271gsm:
6x4 100 sheets £12.99
7x5 100 sheets £18.99
A4 50 sheets £18.99
A3 25 sheets £22.99
A3+ 25 sheets £28.99
13" Roll 10 metres £26.99
17" Roll 30 metres £64.99
24" Roll 30 metres £89.99
Matt Plus 240gsm:
6x4 100 sheets £10.99
7x5 100 sheets £13.99
A4 50 sheets £13.99
A3 25 sheets £17.99
A3+ 25 sheets £22.99
13" Roll 10 metres £24.99
17" Roll 30 metres £42.99
24" Roll 30 metres £58.99
Matt Proofing 160gsm:
A4 150 sheets £18.99
A3 75 sheets £22.99
17" Roll 30 metres £26.99
24" Roll 30 metres £36.99
Double Sided Matt 250gsm:
A4 100 sheets £24.99
A3 50 sheets £27.99
Fine Art / Fibre Base Papers:
FB Gold Silk A4 25 sh £23.99
FB Gold Silk A3 25 sh £47.99
FB Distinction A4 25 sh £25.99
FB Distinction A3 25 sh £48.99
FB Royal A4 25 sheets £28.99
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Parchment A4 25 sheets £22.99
Parchment A3 25 sheets £39.99
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A3 20 sheets £29.99
A3+ 20 sheets OFFER £24.99
Ultra Gloss 300gsm:
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7x5 50 sheets £12.99
A4 15 sheets £11.99
Premium Semi-Gloss 251gsm:
6x4 50 sheets £8.99
A4 20 sheets £14.99
A3 20 sheets £29.99
A3+ 20 sheets OFFER £24.99
Archival Matte 192gsm:
A4 50 sheets £14.99
A3 50 sheets £33.99
A3+ 50 sheets £44.99
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A4 50 sheets £11.99
A3 50 sheets £34.99
A3+ 50 sheets £44.99

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64GB	£95.99

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16GB	£15.99
32GB	£24.99

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800X (120MB/s)

16GB	£26.99
32GB	£32.99
64GB	£47.99
128GB	£94.99

Sandisk Extreme Pro

1066X (160MB/s)

16GB	£33.99
32GB	£47.99
64GB	£82.99
128GB	£149.99

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NB-9L for Canon	£9.99
NB-10L for Canon	£12.99
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BP-511 for Canon	£12.99
LP-E5 for Canon	£9.99
LP-E6 for Canon	£16.99
LP-E8 for Canon	£12.99
LP-E10 for Canon	£12.99
LP-E12 for Canon	£12.99
NP45 for Fuji	£9.99
NP50 for Fuji	£9.99
NP95 for Fuji	£9.99
NPW126 for Fuji	£12.99
NP400 for Fuji	£12.99
EN-EL3E for Nikon	£14.99
EN-EL5 for Nikon	£9.99
EN-EL9 for Nikon	£12.99
EN-EL10 for Nikon	£9.99
EN-EL11 for Nikon	£9.99
EN-EL12 for Nikon	£9.99
EN-EL14 for Nikon	£19.99
EN-EL15 for Nikon	£24.99
EN-EL19 for Nikon	£12.99
EN-EL20 for Nikon	£12.99
EN-EL21 for Nikon	£12.99
Li10B/12B for Olympus	£9.99
Li40B/42B for Olympus	£9.99
Li50B for Olympus	£9.99
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BLN-1 for Olympus	£24.99
BLS-1 for Olympus	£12.99
BLS-5 for Olympus	£15.99
CGR-S006 for Panasonic	£9.99
CGA-S007 for Panasonic	£9.99
DMW-BCG10 Panasonic	£19.99
DMW-BCM13 Panasonic	£19.99
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D-Li109 for Pentax	£12.99
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SLB-1674 for Samsung	£12.99
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BX-1 for Sony	£14.99
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NP-FH50 for Sony	£19.99
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D800/D810 for Nikon	£84.99
D3300/D5300 for Nikon	£74.99
D7100 for Nikon	£84.99

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Universal Chargers

Unipal ORIGINAL	£19.99
Unipal PLUS	£24.99
Unipal EXTRA	£29.99

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Hahnel TC Novo inc. 4xAA	£8.99
Energizer Pro inc. 4xAA	£14.99
Energizer 1 Hr inc. 4xAA	£22.99

Other Batteries

Pre-Charged Rechargables

AA GP Recyko 3+1 FREE	£5.24
AAA GP Recyko 3+1 FREE	£5.24
AA Energizer Extreme (4)	£8.99
AAA Energizer Extreme (4)	£6.99

Standard Rechargeables

AA GP 2600mAh (4)	£9.99
AA Lloytron 1300mAh (4)	£3.99
AA Lloytron 2700mAh (4)	£6.99
AAA Lloytron 1100mAh (4)	£3.99

Lithium Batteries

AA Energizer Ultimate (4)	£5.99
AAA Energizer Ultimate (4)	£5.99
CR123A Energizer (1)	£1.99
CR2 Energizer (1)	£1.99
2CR5 Energizer (1)	£3.99
CRP2 Energizer (1)	£3.99
CRV3 Energizer (1)	£5.99
A544 Energizer Alkaline (1)	£1.99
A23 Energizer Alkaline (1)	£1.99
LR44 Energizer Alkaline (2)	£1.99
CR2025, **CR2032** etc	£1.99

Filters

One of the largest ranges of screw-in threaded filters in the UK, from Hoya, Kood and Marumi. We carry sizes from 24mm, up to 105mm, and offer Clear Protectors, UVs, Skylights, Circular Polarisers, ND4s, ND8s, ND16s, ND32s, ND64s, ND500s, ND1000s, Variable NDs, Starbursts, Close Up Sets and more! Below are just a few examples...

KOOD Slim Frame

UV Filters

37mm	£4.99
40.5mm	£4.99
46mm	£4.99
49mm	£4.99
52mm	£4.99
55mm	£5.99
58mm	£6.99
62mm	£7.99
67mm	£8.99
72mm	£9.99
77mm	£11.99
82mm	£14.99
86mm	£19.99

KOOD Slim Frame

Circular Polarisers

37mm	£12.99
40.5mm	£12.99
46mm	£12.99
49mm	£12.99
52mm	£14.99
55mm	£15.99
58mm	£17.99
62mm	£19.99
67mm	£22.99
72mm	£26.99
77mm	£29.99
82mm	£34.99
86mm	£39.99

KOOD

ND4 & ND8 Filters

52mm	£26.99
58mm	£34.99

Marumi DHG Slim Frame Multi-coated

Clear Protectors

37mm	£10.99
43mm	£10.99
46mm	£10.99
49mm	£10.99
52mm	£10.99
55mm	£11.99
58mm	£12.99
62mm	£14.99
67mm	£15.99
72mm	£17.99
77mm	£19.99
82mm	£22.99

Marumi DHG Slim Frame Multi-coated

UV Filters

52mm	£13.99
58mm	£15.99
62mm	£17.99
67mm	£19.99
72mm	£21.99
77mm	£24.99

Marumi DHG Slim Frame Multi-coated

Circular Polarisers

52mm	£31.99
58mm	£35.99
62mm	£39.99
67mm	£44.99
72mm	£49.99
77mm	£54.99
82mm	£69.99

Hoya HMC Slim Frame

UV Filters

37mm	£12.99
40.5mm	£12.99
46mm	£12.99
49mm	£11.99
52mm	£11.99
58mm	£14.99
62mm	£16.99
67mm	£18.99
72mm	£21.99
77mm	£25.99
82mm	£29.99

HOYA Pro-1D Slim Frame Multi-coated

Clear Protectors

52mm SPECIAL	£16.99
58mm	£28.99
62mm	£31.99
67mm	£35.99
72mm	£39.99
77mm SPECIAL	£29.99
82mm	£49.99

HOYA Pro-1D Slim Frame Multi-coated

Circular Polarisers

52mm	£52.99
58mm	£60.99
62mm	£67.99
67mm	£75.99
72mm	£90.99
77mm SPECIAL	£79.99
82mm	£120.99

Square Filters

We stock three widths of square filters: A-type (67mm wide), P-Type (84mm wide) and Z-Type (100mm wide). Made in the UK, Kood square filters are optically flat, with excellent colour density, neutrality and stability. They received a maximum 5 star rating from Digital Camera Magazine.

P-Type: 84mm wide filters

Standard Holder	£5.99
Wide Angle Holder	£6.99
Filter Wallet for 8 filters	£9.99
Adapter Rings 49-82mm	£4.99
Circular Polariser	£27.99
ND2 Solid	£12.99
ND2 Soft Graduated	£13.99
ND2 Hard Graduated	£13.99
ND4 Solid	£12.99
ND4 Soft Graduated	£13.99
ND4 Hard Graduated	£13.99
ND8 Solid	£14.99
ND8 Soft Graduated	£15.99
ND8 Hard Graduated	£15.99
Light Blue Graduated	£12.99
Dark Blue Graduated	£12.99
Light Tobacco Graduated	£12.99
Dark Tobacco Graduated	£12.99
Light Sunset Graduated	£14.99
Dark Sunset Graduated	£14.99
Starbursts x4, x6, x8	£17.99
Red/Green/Yellow each	£14.99
Six-piece ND Filter Kit	£59.99

A popular kit containing an ND2, ND2 Soft Grad, ND4, ND4 Soft Grad, Filter Holder, plus Adapter Ring of your choice (49-82mm).

Z-Type: 100mm wide filters

Pro Holder	£24.99
Adapter Rings 52-95mm	£8.99
ND2 Solid	£16.99
ND2 Soft Graduated	£17.99
ND2 Hard Graduated	£17.99
ND4 Solid	£16.99
ND4 Soft Graduated	£17.99
ND4 Hard Graduated	£17.99
ND8 Solid	£18.99
ND8 Soft Graduated	£19.99
ND8 Hard Graduated	£19.99
Light Blue Graduated	£17.99
Dark Blue Graduated	£17.99
Light Tobacco Graduated	£17.99
Dark Tobacco Graduated	£17.99
Light Sunset Graduated	£18.99
Dark Sunset Graduated	£18.99

A-Type: 67mm wide filters

Standard Holder	£4.99
Adapter Rings 37-62mm	£8.99
ND2 Solid	£10.99
ND2 Graduated	£11.99
ND4 Solid	£10.99
ND4 Graduated	£11.99
ND8 Solid	£11.99
ND8 Graduated	£12.99

Lens Accessories

Bayonet-Fit Lens Hoods

ES-62 Canon 50/1.8	£9.99
ES-71II Canon 50/1.4	£9.99
ET-60 Canon 75-300/4-5.6	£9.99
ET-65B Canon 70-300/4-5.6	£9.99
ET-67 Canon 100/2.8 Macro	£9.99
ET-67B Canon 60/2.8	£9.99
EW-60C Canon 18-55 IS	£7.99
EW-63C Canon 18-55 IS STM	£9.99
EW-73B Canon 18-55 IS	£9.99
EW-78BII Canon 28-135 IS	£9.99
EW-78D Canon 18-200 IS	£9.99
EW-78E Canon 15-85 IS	£12.99
EW-83E Canon 17-40/4.0	£12.99
HB-32 Nikon 18-105 VR	£7.99
HB-45 Nikon 18-55 VR	£7.99

Stepping Rings

25mm to 105mm
160 different sizes £4.99-5.99

Reversing Rings

52mm to 77mm
Canon, Nikon, Sony, Olympus and Pentax £9.99-19.99

Coupling Rings

49mm-77mm £9.99-£11.99

Screw-Fit Lens Hoods

37mm Rubber Hood	£3.99
40.5mm Rubber Hood	£3.99
43mm Metal Hood	£5.99
46mm Rubber Hood	£3.99
46mm Metal Hood	£5.99
49mm Rubber Hood	£3.99
49mm Shaped Petal Hood	£6.99
52mm Rubber Hood	£3.99
52mm Shaped Petal Hood	£6.99
55mm Rubber Hood	£3.99
55mm Shaped Petal Hood	£6.99
58mm Rubber Hood	£3.99
58mm Shaped Petal Hood	£6.99
62mm Rubber Hood	£4.99
62mm Shaped Petal Hood	£7.99
67mm Rubber Hood	£4.99
67mm Shaped Petal Hood	£7.99
72mm Rubber Hood	£5.99
72mm Shaped Petal Hood	£9.99
77mm Rubber Hood	£5.99
77mm Shaped Petal Hood	£9.99

Lens Caps

Lens Caps Centre-Pinch	£2.99
Body & Rear Lens Caps	£3.99

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E&EO. Prices may be subject to change, but hopefully not!

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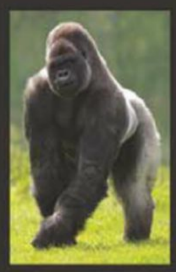

Golden Eagle Experience in Leicestershire 2016 Dates £99
April 10th, May 8th; Golden Eagle will fly, and perch in carefully chosen natural settings. Jesses hidden for static shots. Controlled flying. Also selection from; Owls, Buzzard, Hawks, Goshawk Max. 8 photographers.

Cheetahs, Lions, Foxes, Birds of Prey, Cambs. £119
April 9th, May 7th; Privileged access to Cheetahs, Bengal Tiger, White Tiger & Corsac Foxes. The Cheetah & Tiger enclosures are not mowed for enhanced photographic opportunities. Private Displays by various Birds of Prey, both static & flying. Jesses hidden for static shots. Barn Owl, Eagle Owl and Red-Tailed Hawk etc.

Amazing Bat Photos & Learn Fill-in Flash Techniques £139
April 14th, 15th; Oxfordshire. Take amazing bat photos. Learn how to use balanced fill-in flash on wildlife subjects in different lighting conditions. Max 4 persons. Free loan of Canon digital camera and flash if req'd.

Big Cats at WHF, Smarden in Kent £155
April 2nd, April 23rd, April 30th; Up close to African Lions, Bengal + Siberian + Sumatran Tigers, Serval, Cheetah, Pumas, Jungle Cat, Amur & Snow Leopards, Black Leopards, Clouded Leopards, Fishing Cat. Large open enclosures. UK's most popular photo workshop. Really special photo opportunities from just inches away. Two sets of Lion Cubs born July & August 2013. Huge natural enclosure. Max 12 clients.

Big Cats at WHF, Smarden in Kent - Specialist event 6 photographers - incl. Jaguar £199
March 31st, April 1st, 22nd, 29th; Full day as above, but with additional space at each enclosure. Time is also put aside to review your photos at lunchtime. One to one tuition throughout this very special day. You wil see all the animals as above and you will have more personal interaction with the cats. Now including Jaguar.

Gift Vouchers available for any Workshop or for any Monetary Value.
These Experiences make Wonderful Gifts for that Special Occasion.

Gorillas & African Safari Experience, Port Lympne £155
April 3rd, 24th, May 1st, 2nd; 3 gorilla sessions. No wires, fences or bars throughout the day. Clean backgrounds plus Privileged Access. Photograph at eye level over moat. Huge male silverbacks + family group. Private VIP Safari for 2.5 hours. Rhinos, Wildebeest, Eland, Zebras, Giraffes, Buffalo, Ostriches, various Deer.

Birds of Prey Workshop, Bedford £99
April 16th, 17th; Private flying displays on pre-determined flightpath helps you to focus on birds in flight. Excellent opportunities with carefully chosen backgrounds. Also static shots in outstanding natural locations. Jesses carefully hidden. This location boasts one of the largest collections of Birds of Prey in the UK. White tailed Sea Eagle, Bald Eagles, Hawks, Owls, Falcons, Kestrels, Buzzards and Long Eared Owl (new).

Foxes, Otters, Wildcats, Badgers & more, Surrey. £145
July 13, 14, 15; Inside enclosures 'til sunset. Also Owls, Snakes, Badgers, Polecats, Weasels, Stoats, Hedgehog, Harvest Mice & various Deer. 2 sessions with the foxes, sometimes only inches away from you. inside encloses with Foxes, Otters, Scottish Wildcats. Badgers GUARANTEED. No fences or wires to shoot through.

Small Cats Workshop, Welwyn, Herts. £99
April 4, 25, 28; Privileged access to Snow Leopards, Amur Leopards, Pumas, Caracal, Leopard Cat, Lynx, Servals, Golden Cat. As featured on recent series of TV programs on Animal Planet. Small groups. Tuition

Bass Rock Gannets £225
June 5th, 12th, 20th, 23rd; Private boat. Exclusive use of island for just 10 photographers. 50,000 pairs of nesting gannets on one small island. 4.5 hours photography. Amazing close-ups & fantastic flight shots. Large crate of fish fed to gannets as they dive into the sea. An amazing sight that you will never forget.

Gannets diving off Bass Rock £99
June 24th; Fantastic new workshop for 2014. We sail round Bass Rock without landing on the island. A whole hour of throwing fish into the sea for the Gannets to catch. Amazing diving shots. 1,000 + dives. Tuition.

Farne Islands Puffins (Over 5 hrs photography) £89
June 4th, 11th, 17th, 25th; 20 species of birds. 50,000 puffins. Guillemots, Razorbills, Shag, Arctic Tern colony etc. You will get unbelievably close to some of the species. Get that much sought after shot of Puffins with their beaks crammed full of sand eels. Tips and Tuition. Approximately 5 hours photography.

Pro Birds of Prey Shoot, Bamburgh, Northumberland. £139
June 18th, 19th; Amazing photography opportunities. Hill top views overlooking large extensive valleys and seascapes. Rocks and gorse bushes abound. Golden Eagle, Peregrine Falcon, Snowy Owl, Eagle Owl and Barn Owl will be placed in really natural situations. Jesses will be hidden where possible for those perfect "in the wild" shots. Can combine with Bass/Farne as this location is very close to the Farne Islands.

Pro Birds of Prey Shoot (2) with Short Eared Owl, Northumberland. £139
June 14th, 21st, 27th; Both the falconer and the birds are different to workshop above. Venues are about 20 miles apart. We will take two of the birds down to an amazingly beautiful, little known waterfall. This will provide a unique backdrop for your subjects. The falls are surrounded by trees covered with mosses and lichens. We will photograph up to 10 different species of birds, mainly British. Maximum 8 photographers.

Small Mammals, Insects & Reptiles NEW WORKSHOP £199
June 6, 7; Indoor studio set-ups ensuring professional quality photos of stunning subjects. Studio lighting set up for you. Triggers to fit your camera supplied. Cameras and lenses can be loaned without charge. Innovative set-ups to maximise your opportunities. Max 4 persons. Harvest Mice, Red Eyed Tree Frogs, Praying Mantis, Locust, Beardeed Dragon, Scorpion, Tarantula, Snakes, Lizards etc.

Birds of Prey on Lindisfarne (Holy Island) incl. Short Eared Owl NEW WORKSHOP £139
JUNE 2, 3; New workshop for 2016. Photograph a Short Eared Owl in its natural habitat before continuing with selection from Eagle Owl, Long Eared Owl, Barn Owl, Buzzard, Kestrel, Little Owl, Tawny Owl using boats, Lindisfarne Castle, boat houses & fishing props as backdrops.

For more information, please visit the website or call John Wright on 01664 474040 or 07779 648850 (preferred). We will be most happy to discuss any workshop in detail, or to send more detailed leaflets to anyone without internet access.
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Agfa Super Isolette, with 75/3.5 Solinar lens, VGC £249
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Bronica ETR / S / Si 150mm f3.5 MC lens. VGC £69
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Bronica ETR /S / I / C Plain 90 degree prism finder £29
Bronica GS-1 2x Teleconverter G. In VGC, caps £49
Bronica GS-1 36mm extension tube. In good condition £25
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Canon EF body. Overall VGC and working well. £99
Canon FD 100-200mm f5.6 S.C. zoom lens. Vgc £29
Canon FD 70-210mm f4 Zoom lens. VGC £29
Canon FD 80-200mm f4 FD bayonet lens. £29
Canon FD fit 70-300mm f4.5-5.8 Carl Zeiss Jenazoom II £29
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Contax TLA-30 flash. Excellent condition with Pouch £35
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Coronet Vogue bakelite folding camera. For 127. with case £59
Darkroom Schneider 50mm f4 Componon lens. Nr mint, box £39
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Ensign Folding Rollfilm camera, large size and VGC £29
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Kiev / Contax fit 135mm f4 Jupiter-11 lens, silver, keeper £35
Kiev / Contax fit 85mm f2 Jupiter-9 lens. VGC £79
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Kodak Bantam f4.5 with case, instructions £29
Kodak Beau Brownie. 6X9, black / maroon Very pretty VGC £49
Kodak Beau Brownie. 6X9, black and maroon. £39
Kodak Medalist, with 100mm f3.5 Ektar lens, VGC £169
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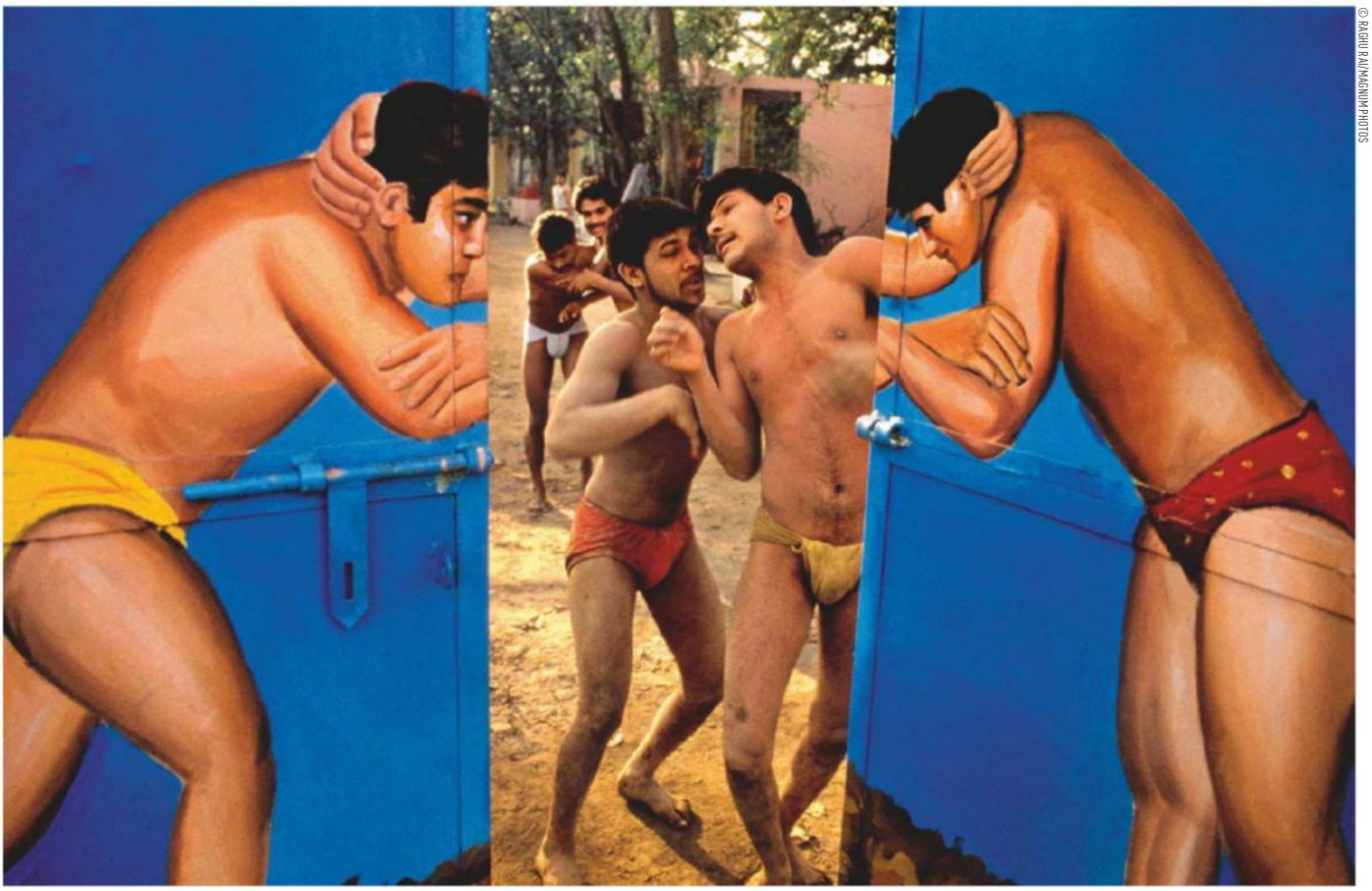
Final Analysis

Roger Hicks considers...

'Wrestling', 1989, by Raghu Rai



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It is almost impossible not to laugh when you look at this picture. First, there's the wonderful way in which the arm of the real wrestler on the right matches almost perfectly with the painted arm on the right-hand gate. Second, there's the contrast between the massive figures painted on the gates and the altogether less massive physiques of the human wrestlers. Third, the poses of the real wrestlers do not look particularly martial. In fact, you could be forgiven for thinking that the man in the red trunks is tickling the man in the yellow trunks. Maybe he is: that ghostly blurred hand on the taller man's chest, just below the nipple, is presumably his, though it seems a bit bigger than you would expect.

There are interesting details, too: the red and yellow trunks in both cases and the figures in the background. One of them is clearly aware of the camera. You can take this in one of three ways. Either it 'spoils' the picture by distracting attention from the rest of the composition, it adds to the composition by filling out the context, or it doesn't really matter very much because it is some time before you notice them. I favour the third interpretation.

Light direction

Then there is the colour. 'Colourful' is one of the adjectives most often associated with India, and this picture more than meets our preconceptions, along with the dusty earth on which the combatants are wrestling. You can see from the shadows that Rai was shooting against the light. My guess would be fairly early in the morning. The sun is low in the sky – look at the backlighting, especially on the figures at the rear – but the air is clear and the sunlight is fairly yellow, without the red haze you would expect in the evening. This in turn suggests that the light from behind the photographer was more or less blue sky light, so getting this good a colour balance must have been quite demanding.

The last questions are: how many shots did it take to get this, and how were they taken? Modern 'spray and pray' techniques were rarely feasible in film days – 10fps runs through a 36-exposure film in under 4 seconds – so there must have been some degree of anticipation and luck. Moreover, Rai may not have realised what he had got until he saw the processed chromes. Did he go back day after day, studying what they learned? Did he ask the wrestlers to practise near the gates? It seems unlikely that this was a lucky spur-of-the-moment shot, even for a renowned photographer such as Raghu Rai. AP

Roger Hicks has been writing about photography since 1981 and has published more than three dozen books on the subject, many in partnership with his wife Frances Schultz (visit his new website at **www.rogerandfrances.eu**). Every week in this column Roger deconstructs a classic or contemporary photograph. **Next week he considers an image by Gabriel Lippmann.**

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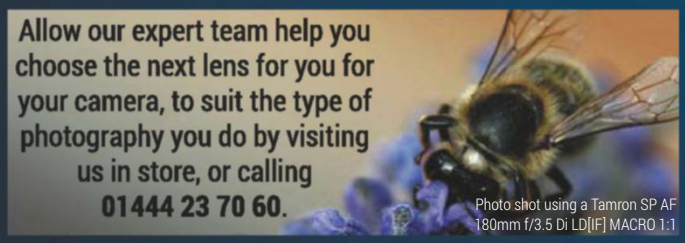

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